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National Academy of Sciences, 1972, An evaluation of the concept of storing radioactive wastes in bedrock below the Savannah River Plant site, Washington, D.C., 86p.




Specific Comments:

L-16 1) Page IV-5, Figure IV-1:

Two curves are labeled Eu-154. One of these labels is in error and should be corrected in the final EIS.

The figure has been corrected.

L-17 2) Page V-3, subsection 3, "Impact on Air and Water Quality", in the third paragraph: The use of settling ponds suggests that there will be some contamination present. What monitoring procedures will be provided and what radioisotopes and concentrations are expected? Also, what would prevent contamination of offsite groundwater?

If settling ponds are used in any alternative actually implemented, monitoring procedures and barriers against contamination of offsite groundwater would be similar to those used for present operations at SRP and would comply with all Federal and State regulations in effect at the time. Details of such facilities would be covered in later, project specific documents, when detailed system design is available.

L-18 3) Page V-16, Table V-9: The Radiation Exposure Limits in the drinking water regulations take precedence over DOE exposure limits. (See "National Interim Primary Drinking Water Regulations," EPA-570/9-76-003). Also what isotopes are included for this table and how are they released? A table such as this may also be needed in reference to the Clean Air Act.

Section V-B.4 and Reference V-13 have been modified to assure that any such releases will comply with all applicable Federal and State standards.

The limits apply to the radiation that could be received from a weighted sum of all isotopes released, as stated in the referenced text of the regulations.

L-19 4) If the reconstituted waste is demineralized and processed to glass, this would result in 5100 cannisters of glass (ERDA 77-42). There is no reference to this number of cannisters in this document, only a statement that the glass matrix would be 35 percent waste. Further details should be provided in the final EIS. There is a conflict between Table V-4, p. V-11, of this document and Table III-8 in ERDA 77-42 as to the time requirements for this option. In one case, it is 10 years; the other computes to 5 years. This discrepancy should be clarified and an explanation should be provided as to how the 5 years or 10 years was calculated. For example, if 23,625 salt cake cannisters were filled over a 10 year period, this works out to 45 per week, equaling an average process load of 45,000 gal/wk. This is an intensive operation which should not be neglected and discussed lightly. More explanation is needed in the final EIS.

The "reference case" duration for processing the SRP inventory has changed between the present time and the time of issuance of ERDA 77-42, but the total waste volume has not. This EIS estimated the potential environmental impacts based on total waste volume and individual canister characteristics rather than rate of processing. The actual rate of processing is likely to change further during this preliminary period of research and development, design, and testing, but more details of the final alternative to be implemented will be covered in the project-specific EIS for that alternative.

L-20 5) Page V-24: The discussion of hazards associated with nuclear waste is incomplete. Preliminary EPA studies of disposal of high-level radioactive waste in mine repositories indicate that there are pathways, particularly through water, that engineered barriers cannot be depended upon to prevent over long periods of time. The migration of some nuclides is not slowed to any great degree by geological barriers. The discussion of dilution on this page does not recognize that population dose is not significantly affected by dilution. In addition, the DOE staff implies that there will be permanent existence of the SRP exclusion area. As stated previously, EPA's forthcoming criteria states that reliance cannot be placed on institutional controls for periods beyond one hundred years.

The risk analyses for all the alternatives either include abandonment as part of disposal, or discuss the environmental consequences of abandonment of the long-term storage modes, thereby converting them to disposal.

It is beyond the scope of this Programmatic EIS to debate the usefulness of integration of very low individual exposures over long time periods to arrive at large population exposures. However, integration over 10,000 years has been added, along with a comparison with natural background.

The EPA limit of 100 years for reliance on administrative control has been included in the abandonment scenarios for continued tank farm operation and surface storage in an air-cooled vault at SRP.

L-21 6) Page V-26: The last paragraph on this page states that it is extremely unlikely that people will continue to drink well water from a location directly over a leak into the aquifer. In the long term, we believe knowledge that the waste repository exists and assumptions that water supplies will be monitored for radioactivity cannot be depended upon.

The analyses and conclusions given in the document do not depend upon future populations avoiding drinking any contaminated water - worst case results are given throughout the document, assuming no corrective actions are taken. However, DOE and other reviewers believe that it is important to point out mitigating measures that could be taken, and these are discussed in more detail in Section XII-D.

L-22 7) The summary of exposure risks in Tables V-12, V-13, V-14, V-15, and V-16 is inadequate in that the range of possible release events is very small. The time integrated risk is also artificially small because of the limitation of the integration period to three hundred years. More events should be considered, as well as a longer time period.

The tables have been modified to include risks integrated for 10,000 years, and to include abandonment of Alternative 1 after 100 years, as requested by EPA. As part of the bounding approach to this risk assessment, all the events that could contribute significantly to overall risk have already been included, and are described in more detail in the backup reference, ERDA-77-42.

L-23 8) Page V-27: Doses to a reasonable population should be calculated. Our criteria suggest that this be done for a much longer period than the 300 years given, since the waste is hazardous for longer than 300 years.

As stated in Section V, the population at risk was assumed to grow by a factor of 5 over a 150-year period. All populations that could incur individual exposures greater than a small fraction of background were included. The analysis was expanded to include integration of risks over 10,000 years.

L-24 9) Pages V-33 and V-34, subsection 4, "Offsite Land Contamination": This section should dicuss and reference the existing Protective Action Guides to ensure agreement with the Guides as well as the "Proposed Guidance on Dose Limits for Persons Exposed to Transuranium Elements in the General Environment," EPA Report #520/4-77-016.

Many details of the risk assessment are not included in this EIS but, as stated in the text, are included in the major reference documents in an effort to make this document more easily readable. As stated in the reference, ERDA-77-42, the Protective Action Guides were consulted in deriving the limits used for land contamination. The subject is still in a process of change regarding regulations and guides, and the latest available information will be used in documents related to any alternative proposed for actual implementation. The analysis presented is enough to show that land contamination possibilities from unlikely events would not be a major decision factor regarding the conduct of the research and development, design, and testing program covered in this Programmatic EIS.

L-25 10) According to the draft EIS, the status of present technology of glassification and vitrification is sufficient to have a waste storage facility operational by 1985. At that time, 60 x $10^6$ gallons of reconstituted waste will be fed to a demineralizing facility (p. IV-4) from processing and solidification. If the waste is processed so that the high activity fraction is separated and solidified to glass, there would remain 24.5 x $10^6$ gal of decontaminated salt cake (note on p. IV-22 a value of 16.3 x $10^6$ gal is mentioned, an apparent conflict). If shipped offsite, it would involve approximately 23,625 canisters (p. V-45). This means that each cannister is capable of holding over 1000 gallons of salt cake. The draft EIS does not give an adequate explanation about this cannister requirement (though it is diagrammed in past reports-ERDA 77-42), nor does it provide the accident frequency data for vehicle loads exceeding 20,000 pounds. The salt cake alone weighs 19,500 pounds using salt density of 2.25 g/ml (ERDA 77-42). There is not enough information about this processing and shipping requirement; reference should be made in the final EIS to existing industrial experience with mass production of cannisters of high quality, glass formation processes, and demineralizer removal efficiences.

Radiation exposures and possible transportation accidents for alternatives that might involve shipment of decontaminated salt offsite are discussed in Section V-E.3. As noted in the comment, the canister is described in ERDA 77-42 and is incorporated in this EIS by reference. The injury frequency data given on p. VI-II of this EIS was taken from WASH-1238 which is based on actual accident frequency information during 1968 and 1969.

L-26 11) Page VII-2, table VII-1: Are the cost of salt cake disposal options included in Table VII-1, "Commitment of Resources?"

Yes, the cost of disposal of decontaminated salt cake in existing tanks at SRP is included, where applicable to the specific alternative, as pointed out in Section V-E, "Potential Effects from Decontaminated Salt Storage."

L-27 12) Page XII-3: See comments pertaining to pages V-33 and V-34.

See response to Comment L-24.

L-28 13) Page XII-1, 2nd paragraph: Is the $1000/person-rem based on a lower level of carcinogenesis? See ICRP-26. Furthermore, EPA does not believe the $1,000 per person-rem represents a valid measure of reducing risk.

It is not clear from the comment what a "lower level of carcinogenesis" means. The reasons for including an example cost-risk analysis involving a dollar value for radiation risk are discussed in Section XII-1.

L-29 14) In Table XII-7 on page XII-9 (Summary of Costs and Exposure Risks for Alternative 2 - Subcase 2: Glass Stored in Onsite Surface Storage Facility and Decontaminated Salt Cake Returned to Onsite Waste Tanks) the published value for the Incremental Cost-Risk in dollars/person-rem has been incorrectly calculated as $31,900. The value should have been $28,600.

The value given in the Draft EIS was calculated before round-off of the numbers to be presented in the table, thereby giving rise to the potential that the reader may calculate slightly different values. For this final version of the EIS, cost numbers and some risk numbers have been updated, and entries in the table have changed.

L-30 15) Section XII-B, pages X-II-6-XII-12. The Incremental Cost-Risk technique for comparing the various high-level waste management alternatives has several weaknesses. Ideally, a method of comparing alternative waste management techniques should use the present waste management techniques as the basis for the comparison. The order of the ranking (by a methodology) should be insensitive to choice of the base case. *Unfortunately, the Incremental Cost-Risk methodology meets* neither of these criteria. First, the Incremental Cost-Risk estimates incorrectly use the least expensive alternative (Alternative 3) as the base case. Since a change in the method of managing high-level wastes can only mean a change from the present waste management technique, the comparison with the least expensive alternative has little meaning, unless the present method is also the least expensive alternative. For example, if the present method of waste management (Alternative 1) is used as the base case, instead of the least expensive technique (Alternative 3), the order in which the three subcases of Alternative 2 are ranked changes. The final EIS should address these weaknesses in the Incremental Cost-Risk technique.

The order of the alternatives' ranking necessarily must depend upon the base case, because the waste is already in hand and is stored for an interim period in a method that can branch to either less expensive or more expensive alternatives, or remain the same.

As a coincidental matter, updated cost estimates between the *draft EIS and this final EIS have resulted in Alternative 1* becoming the least expensive and, therefore, base case.



L-31 16) Page XII-12, Paragraphs 4, 5, and 6 pertaining to the quotations from NCRP 43: Again, ICRP-26 should be carefully studied and compared to NCRP 43 since ICRP-26 is the more recent reference.

Nothing is contained in ICRP-26 that negates the judgements expressed in NCRP-43, but NCRP-43 is the specific reference.

L-32 17) Page XII-13, Table XII-10: In the second column headed by "Estimated Average Radiation Dose Risk, person-rem/year." The 200,000 appears to be whole body exposure, and the 180,000 appears to be based on the mean effect on bone marrow: What is the basis for the remaining numbers? Are they total body numbers?

As stated in the footnote to Table XII-10, all the numbers in the first column are on the same basis and are whole body equivalent exposures.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 1 1977

Mr. W. H. Pennington
Director, Office of NEPA Coordination
U.S. Energy Research and Development
Administration
Washington, D.C. 20545

Dear Mr. Pennington:

L-33 The Environmental Protection Agency (EPA) has reviewed the Report on "Alternatives for Long Term Management of Defense High-Level Radioactive Waste at the Savannah River Plant, Aiken, South Carolina" (ERDA 77-42/1,2). The stated purpose of this site specific report is to describe the different alternatives along with their probable relative costs, risks, and uncertainties. A secondary purpose is to raise the issue of methodology for decision making in nuclear waste management. Subsequent to this report, before any long-range waste management plan is implemented, an environmental statement *will be prepared to assess in detail the potential environ*mental impact of all of the preferred alternatives.

The comments in this letter are directed to the related "Alternatives" document (ERDA 77-42), which preceded the draft EIS, rather than the EIS itself. The "Alternatives" document was issued for public review, but was never formally revised. However, comments received on that report were considered by DOE in the preparation of this EIS. Specific answers to the EPA comments on the "Alternatives" document are provided here since they were appended to their EIS comments and since they address data and analyses upon which the EIS is based.

L-34 With regard to the alternatives examined in the report, it is noted that three of the eight considered in detail involve the disposal of high-level waste in bedrock below the SRP. EPA reviewed an EIS for this alternative in 1972, and concluded that serious uncertainties existed about the potential impact of this disposal method. To our knowledge little or no significant information has been developed to resolve these uncertainties during the past five years. While an attempt is made in the report to demonstrate that this alternative is the most cost-effective, the large uncertainties in the potential impact resulting from use of this method are sufficient cause for its rejection. Therefore, we continue to have grave concerns relative to the acceptability of this alternative and believe that the bedrock storage alternative should be totally eliminated as a permanent high-level waste disposal technique at the Savannah River Plant site. We would further state that the SRP site does not appear to be acceptable as a site for permanent disposal for high-level radioactive waste and that any of the storage alternatives for SRP, as stated in the report, would constitute temporary solutions requiring later remedial action.

The bedrock alternatives were included in the "Alternatives" document because, if these alternatives are indeed feasible, they represent the lowest cost solutions to the problem of disposing of the SRP high-level wastes. However, as emphasized in the text, major uncertainties do exist about the safety of the bedrock alternatives. These uncertainties can be resolved only by large-scale research programs, and no such large-scale research programs are currently underway or planned, in part because of the unsatisfactory ratings given to the bedrock alternatives by EPA. Disposal of the immobilized SRP waste would be at future Federal repository.

(contd)

L-35 Before a decision can be made regarding the ultimate disposition of the high-level waste at Savannah River Plant (SRP), presumably at an approved high-level waste disposal site, we believe a thorough examination of the objectives of waste disposal must be conducted. This is necessary in order to clearly define what is to be accomplished before implementation steps are taken.

In the period since EPA recommended a "thorough examination of the objectives of waste disposal," a major review of the nation's nuclear waste management program was undertaken by the Interagency Review Group (IRG) on Nuclear Waste Management, whose final report was published in March 1979. The IRG set forth planning objectives and broad technical and implementation objectives. Specific objectives, standards, and criteria need to be established by EPA and NRC through the regulatory process to complement the stated planning objectives. DOE has, and will continue to modify its technical objectives and implementation programs in response to emerging environmental protection criteria. These issues will be revisited in the course of subsequent site-specific environmental reviews.

L-36 EPA is in the process of developing environmental criteria for radioactive waste management. These criteria will address the objectives of waste management and will provide a basis for what must be accomplished in waste management activities to provide assurance of public health and environmental protection. EPA is also developing environmental standards for high-level radioactive waste management which will be applicable to any disposal option used for the SRP high-level wastes. Until such time as these criteria and standards are issued in final form, it is premature, in our opinion, to make firm decisions regarding the final disposition of any high-level waste.

Although the final waste management alternative chosen for disposing of the SRP high-level waste must meet all applicable EPA criteria and regulations, DOE must start its initial studies now so as to be ready to make firm decisions when the final criteria and standards are available. This is consistent with the recommendations of the Interagency Review Group on Nuclear Waste Management (TID-29442) in that immobilization of defense waste should begin as soon as practicable. It is also hoped that the results of the DOE waste management research and development programs will assist in the development of criteria and standards by the regulatory agencies. The proposed R&D program will be undertaken with sufficient flexibility so as not to foreclose any of the reasonable disposal methods under consideration prior to completion of a project-specific EIS.

L-37 While the SRP alternatives report is an important first step in exploring the disposal alternatives, we believe, in light of the above considerations, that no decision should be made for a particular alternative until clearly defined objectives are available. EPA expects to promulgate its proposed guidance for radioactive waste management in the next few months. We are in agreement with the need to find suitable disposal methods as soon as possible, but waiting a few months before committing significant resources and investments to specific alternatives seems prudent.

Neither the "Alternatives" document nor this EIS are aimed at arriving at final SRL high-level waste disposal methods. The purpose of this EIS is to obtain public inputs to orient the DOE research and development effort. Selection of the SRP high-level waste management alternative and the repository will be supported by future environmental documents.

If you or your staff have any questions or wish to discuss our comments in more detail, please call on us.

Sincerely yours,

(signature unreadable)
for
Rebecca W. Hanmer
Director
Office of Federal Activities (A-104)

Enclosure

A-ERD-A00131-SC
Review Comments Prepared by
United States
Environmental Protection Agency
on
Alternatives for Long Term Management
of Defense High-Level Waste
at the Savannah River Plant,
Aiken, South Carolina
ERDA Report No. (ERDA 77-42/1,2)

General Comments

L-38 We believe that the first step which must be taken is to define the problem which the proposed action is to solve. For example, certain of the alternatives presented would suffice for temporary storage as is now the practice. Other alternatives would more appropriately fit a category of long-term storage (say for 100 years) such as glassification and vault storage; while some alternatives may be more suitable for a permanent storage philosophy (in keeping with the long-lived isotopes involved) in glass encapsulated canisters buried in deep geological formations. Once the key time-related criteria have been determined and categorized, technical alternatives could be assessed for their applicability to well engineered systems in each time group. The objective would be to provide optimal environmental integrity in each time category.

Although the various alternatives considered do indeed leave the wastes in very different final states, all are carried to the same end point in the analysis by determining the long-range hazards from the different final forms; e.g., the hazards of abandoning the wastes in their existing tanks are compared with the hazards of leaving a glass waste form in a geological repository. The objective of the DOE waste management programs is to protect the human environment.



L-39 Given the limitations on the accuracy of the information presented in the report, the usefulness of the cost comparisons is also limited. Moreover, inclusion of all costs and a sensitivity analysis of assumption could significantly change relative costs of the alternatives. Thus, to avoid misinterpretations of the calculated cost estimates, an extensive explanation of the limitations of the report should have been presented, and the title of the tables should have indicated the limitations on the information that is presented. There are three types of limitations on the cost information presented in the report.

1. Only certain types of costs are considered: budgetary costs for the storage systems, radiation risk to the public, and land contamination. Environmental costs, social costs, on-site radiation risk, and monetary costs other than engineering costs, are not considered.

2. The costs that are presented are calculated only for certain assumptions, e.g., budgetary costs and radiation risk are calculated for a limited area, and for a limited time.

3. Methodology and assumptions used in calculating budgetary costs are not fully explained.

See response to L-11.

L-40 Other major inadequacies in the report are the failure to consider any impact beyond 300 years, and the assumption that the Savannah River Plant site will remain a controlled, low population, Federally owned area for at least the 300-year period. Restriction to 300 years implicitly considers that only the fission products, specifically, strontium-90 and cesium-137, are of concern. This is contradictiory to the description of the waste (page III-5) as containing plutonium-238 at a concentration of $1 \times 10^{-2}$ Ci/gal (2,600 nCi/g) and plutonium-239 at a concentration of $3 \times 10^{-4}$ Ci/gal (80 nCi/g), plus other actinides. Even after the 300-year period the plutonium-238 would still be present in a concentration of 230 nCi/g and the plutonium-239 decay would, of course, be negligible. Changes in population density cannot be ruled out (how many people lived in the present Phoenix, Ariz. city limits 300 years ago?) nor can governmental or societal changes. The discussions of abandonment, which presumably include loss of government ownership of the area, do not include population build-up or the intrusion into the area of curiosity seekers, archaeologists, or children.

See responses to L-9 and L-10.

Specific Comments

L-41 1. Bedrock Storage (Disposal) at Savannah River Plant

EPA has serious questions as to whether this is an appropriate method of disposal and more particularly whether the proposed site and scale of exploratory activity should be undertaken without a broader assessment of the generic issues of disposal.

See responses to L-3 and L-12.

L-42 More complete discussion and documentation of the results of previous investigations of hydrogeology would be necessary for an independent evaluation of the applicability at Savannah River Plant of the philosophy that the long-term storage of the ERDA's high-level wastes should rely only minimally on human surveillance and that the protection should be achieved primarily through isolation of the wastes within natural barriers. Our concerns with this philosophy of containment at Savannah River Plant arise from the fact, that deep testing to determine and interpret hydro-geologic parameters of the natural ground water regime is difficult under any circumstances, and is especially difficult in fractured aquifers such as the bedrock at Savannah River Plant. It is not possible to validate some of the physical assumptions of existing movements, and extrapolations for hundreds to thousands of years must be made with hydraulic coefficients derived from limited test data and relatively short testing periods. Furthermore, it is likely that future development and use of the Tuscaloosa aquifer above the bedrock will perturb the hydrologic regimes in both the Tuscaloosa and the bedrock in ways that are not entirely predictable at present. In the report, a section on Bedrock Disposal should specifically address the NAS report on geologic aspects of radioactive waste disposal, dated May 1966, and why ERDA is proceeding with a project of this magnitude contrary to NAS study conclusions.

See responses to L-13 and L-14.

The following comments on Bedrock Storage are more specific to the Report itself:

L-43 A. On page II-8 the Report discusses the third alternative, that of slurrying the existing wastes into a bedrock cavern dug in an impermeable Triassic mudstone under the Savannah River site. The advantages and disadvantages of this alternative are discussed at greater length in other sections with principal emphasis on possible events which could threaten the integrity of such a cavern after it has been filled (even partially filled) with the wastes. It would seem that the Report should give some attention to the prospect of the actual tunneling procedure creating cracks in the rock, disrupting the caverns integrity, and connecting the cavern to the aquifier above.

Previous analysis has indicated that tunneling in the triassic mudstone should be only a minor source of mudstone cracking. However, this analysis can be verified only by an actual program of exploratory mining; such a program is not now planned.

L-44 B. As an extension of the discussion on geologic disposal, the Report indicates on page II-9 that geologic disposal options would require large scale exploratory shafts for time-periods long enough to give a high level of confidence of the shaft's continued integrity after sealing. The obvious question that comes to mind in connection with this statement is "How long will the time-periods have to be to give that assurance?" Considering the scheduling needs and the decisions that will have to be made in the near future, it seems that thorough assurance of this disposal technique may not be available in the time frame required.

The actual time periods required to assess the integrity of the mudstone caverns cannot be determined until actual mining experience uncovers the actual geological conditions. However, if the high integrity rock is found, unless investigations which can be completed in a few years discover a potential problem, we would be assured of long-term integrity.

L-45 C. On page III-1 the statement is made that once the cavern is sealed it will require no maintenance or surveillance. Even though maintenance and surveillance may not need to be extensive, it hardly would seem prudent to abandon the site. Surely some inspection and monitoring would continue so as to provide an early warning of potential problems.

In actuality, a long-term surveillance program would almost certainly be maintained on the decommissioned repository. However, one of the design criteria for the repository would be to minimize the risk of abandoning the repository in accordance with the EPA policy guidance that limits the duration assumed for institutional control to 100 years.

L-46 D. On page III-22 Alternative 8 is discussed. The Report indicates that the bedrock cavern containing canned glass wastes is expected to eventually flood after sealing. It seems that if the cavern is expected to flood when it contains solidified wastes that it would similarly be infiltrated if the cavern contained liquid wastes. One could also conclude that if water can get in, the liquid wastes could use the same pathways to get out - possibly to the surrounding ground water. The Report should give more information on this projected flooding and what implications such flooding would have for the success of the bedrock options.

A cavern containing liquid waste would likely flood as readily as one containing solid waste. Such flooding is not expected to be of serious concern, however, because diffusion times from the cavern to the surface ground water are expected to be very long.

L-47 2. An appendix is needed to deal specifically with the dose modeling used throughout. For example, the use of a deposition velocity is frequently mentioned but it is not stated how this ground deposition is used in dose calculations, i.e., food pathway and/or external exposure. Appendix B has more than its proportionate share of errors and, as it stands, detracts from the overall effort. The proper evaluation and interpretation of actual environmental data as related to individual and population exposure, however, could be of real value in supporting the postulated results of accidents.

Dose modeling is covered in a general way in Section V of this EIS and in more detail in appendices F&G of the referenced ERDA-1537 (V-11). The primary influence of the deposition velocity is on the potential exposure from inhalation by an offsite individual because deposition reduces the airborne activity reaching an offsite location. Both the food pathway and external radiation exposure are minor compared to inhalation. Specific comments on Appendix B are addressed later in these responses.

L-48 3. Tables III-5 and III-7 should have a value of Ci/unit volume as a function of the various waste reduction techniques so that a better judgement can be made of the heat generated by the various solidification methods. The volumes also should be presented along with each alternative so that eventual volumes may be predicted for each storage or disposal technique.

Waste container volumes, curie contents, and heat generation rates for each of the solid waste forms for each alternative, as appropriate, are discussed in Section III of ERDA 77-42. More recent information on the glass waste form is contained in Section IV of this EIS (DOE/EIS-0023). Tables III-5 and III-7 of ERDA 77-42 present information on radionuclide content of the SRP wastes and are not concerned with waste techniques. Tables III-8 through III-12 include Ci/unit volume data for the feed and the product to illustrate waste volume reduction. These tables also include the total product volume.

L-49 4. Water and resource usage must be considered because some processes require more water than others. The disposal and/or reuse of these resources should be discussed.

Resource use for each alternative is discussed in Section VII of this EIS (DOE/EIS-0023). Disposal of these resources and associated waste after usage will be in conformance with applicable regulations and will be addressed in project-specific EIS's. Estimated water requirements associated with the alternatives covered in this EIS are not considered to be significant; some water is recycled to permit smaller process equipment and to minimize water requirements.

L-50 5. page III-3 - It is not clear how the population dose commitment was calculated over the 300-year period. This should be further addressed in this section.

The basis for a population dose integrated over 300 years is discussed in Section V.C.3 of this EIS and response to comment L-10.

L-51 6. page II-F - Table II-1. 3rd column, 3rd row should be 0.24 not 0.18.

Entry at 3rd column, 3rd row of Table II-1 is 0.24.

L-52 7. page II-4 - The NCRP has cast doubt on the use of the linear hypothesis model, but has suggested no alternative basis for action.

This subject is discussed in detail in the response to comment M-3.

L-53 8. page II-5 - The possibility of vaporizing cesium is ignored.

Significant cesium vaporization does not occur in any of the alternative processes presented in ERDA 77-42 and, therefore, does not present a significant hazard.

L-54 9. page II-5 - The reliance on the large exclusion area and low population density may refer to a temporary condition.

The large exclusion area and low surrounding population density are reasons why the present hazards of the waste are limited and does not necessarily apply for the future.

L-55 10. page III-5 - The cesium-137 content is 3 Ci/gal (800 uCi/ml). Even after the 300-year period considered, this is still 800 nCi/ml, a significant concentration.

Agree

L-56 11. page III-6 - Figure III-2. $^{94}Tc$ should be $^{99}Tc$.

$^{99}Tc$ is correct. This is a typographical error which does not affect the analysis.

L-57 12. page III-8 - The sludge contains 30 Ci/gal of strontium-90 (8 mCi/ml). After the 300-year period, there is still 8 uCi/ml. Similarly, the plutonium-239 content of the sludge is $3.5 \times 10^{-3}$ Ci/gal (900 nCi/ml), well above the proposed TRU limit of 10 nCi/g.

These observations are correct.

L-58 13. page III-8 - Exponent error in $^{238}Pu$ concentration after 10 years. $3.5 \times 10^{-3}$ should be $3.5 \times 10^{-5}$.

$3.5 \times 10^{-5}$ is correct. This is a typographical error which does not affect the analysis.

L-59 14. page IV-2 - The radioactive materials left after decommissioning will be a small fraction of the material in storage, as stated. However, these materials may be in a much more available form to the environment.

One of the objectives of decommissioning would be to minimize the likelihood that these remaining nuclides could migrate to the biosphere before decay to harmless levels.

L-60 15. page IV-2 - The use of natural levels (and medical levels) to indicate the comparative harmlessness of the wastes is improper. The radiation from the waste is an additional exposure and must be judged on its own merits. For example, the expected exposure from contamination of the Tuscaloosa aquifer is given as 180 man-rem per year. Over a 300-year period, this would be 54,000 man-rem which would justify an appreciable additional expenditure to eliminate the dose.

Radiation exposures resulting from natural and medical sources are presented to put the predicted exposures from disposing of the wastes in perspective. Table X-6 compares the alternatives on a cost-risk basis by adding justified additional expenditures to budgetary costs as suggested.

L-61 16. page V-1 - It is not clear whether there is any possibility that the cooling duct intakes or exhausts could be clogged, with consequent loss of cooling.

As stated on p. V-17, "the cooling inlets and outlets extend the entire length of the building, and it is unlikely that they could become plugged with dust or debris over very long time periods."

L-62 17. page V-8 - The canisters in the air-cooled vault "are expected to maintain their integrity for the indefinite future if they are kept dry." How long is indefinite? How will they be kept dry?

This comment refers to the discussion of routine releases. In this context, the canisters would be kept dry by the protection afforded by the storage vault until a nonroutine event could compromise the vault's integrity.

L-63 18. page V-8 - Refers to Reg. Guide 1.72 in text by 1.74 in the reference.

U.S. Nuclear Regulatory Commission Reg. Guide 1.76 (Design Basic Tornado for Nuclear Power Plants) is the correct reference.

L-64 19. page V-11 - Table V-1. The time-frame is uncertain. Is the food pathway considered or just immersion and inhalation? Is the dose from other nuclides listed in Table III-3 considered insignificant as compared to these four? Last isotope listed should be $^{238}Pu$ not $^{239}Pu$. What is the assumed fraction of the total vault inventory to be released?

Table V-1 gives consequences of a sabotage event if it occurred before significant radionuclide decay (about 1990). The exposures are lifetime dose commitments from the airborne pathway through inhalation ingestion and immersion. Due to small amount of most radionuclides and half-life considerations (Table III-3 and Table III-7 of ERDA 77-42), exposures would arise primarily from the four isotopes listed. The typographical error for the $238_{Pu}$ has been noted. The derived release fractions are discussed in the text preceding Table V-1, and in the reference covering sabotage. The total release fraction is not given because of classification sensitivity.

L-65 20. page V-11 - Is the figure of $1.1 \times 10^{-3}$ g of particles per gram of glass or per canister?

The figure $1.1x10^{-3}$ applies to gram of particles of diameter 16 mm and smaller per 1.87 cal/gram energy input. The energy input was assessed to be applied to a release small enough that the experimental results would apply.

L-66 21. To what particle size is the settling velocity of 1 cm/sec appropriate? How sensitive is the calculation to this parameter?

The settling velocity of 1 cm/sec applies to particles of 10 μm in diameter, but was applied to all particles 16 μm in diameter and smaller. It is believed this is a conservative approach, lacking fine structure in the experimental data on particle size distribution below 16 μm. The offsite exposures are sensitive to settling velocity, but this point was not investigated in detail because the potential offsite exposures are so small.

L-67 22. page V-12 - Table V-2. Last isotope should be $^{238}Pu$.

The last isotope listed in Tables V-1 and V-2 of ERDA 77-42 is incorrectly given and should be "$238_{Pu}$."" This change does not alter the results of the analysis.

L-68 23. page V-17 - The possibility of increased leach rates because of radiation damage to the glass has not been considered.

A large research and development program is being conducted on alternate waste forms as discussed in Section IV.D of this EIS (DOE/EIS-0023). Results of radiolysis studies to date indicate that leachability of borosilicate glass containing typical SRP high-level waste is unaffected by exposures equivalent to storage for up to 1 million years.

L-69 24. page V-18 - Same as above.

See response to the above comment (L-68).

L-70 25. page V-22 - Table V-8

a. What were the source terms used? Table VIII-2?

b. A footnote should be used to give population size considered.

c. Rates of bone to whole-body dose for $^{238,239}Pu$ is 4 for river water pathway but 40 for airborne pathway. These values should be the same.

d. Title columns in Table V-8B same as in A. Dose to man, man-rem/year.

e. Was lung dose intentionally omitted?

Table VIII-2 of ERDA 77-42 gives the source terms (1975 release guides) for radiation dose calculation. The population of the sector used (most populous sector which includes Augusta, 6A) was 203,000 out to a distance of 150 km. The ratio should be about 40 for both pathways. The bone dose from $^{238,239}Pu$ in Table V-8a should be changed from 0.028 man-rem to 0.28 man-rem; this was a typographical error and does not alter the analyses. Table V-8 is adequately titled, since this is a single table. Radionuclide release was assumed to be soluble which results in the highest dose to the critical organ. In this case, lung dose was more than an order of magnitude less than bone dose.

L-71 26. page V-23 - Table V-9A, B. Rates of bone to whole body dose for $^{238}Pu$ and $^{239}Pu$ are not consistent in Tables A and B. There is, most likely, an exponent error. Footnote population size.

The whole body dose for the maximum individual in Part B of Table V-9 was a typographical error. The whole body dose should be $1.8 \times 10^{-4}$ mrem instead of $1.8 \times 10^{-8}$ mrem. Population of the sector used was 203,000 out to a distance of 150 km.

L-72 27. page V-26 - Table V-12A, B and Table V-13A, B. Several exponent errors. Ratios between the two tables are not consistent.

The data in these tables are correct.

L-73 28. page V-27 - Same comments as above in page 26. Bone dose from $^{90}Sr$ should be included in Table V-14B.

The data in these tables are correct with the exception of the population dose -- air pathway (V-14A) in which the bone dose for $^{90}Sr$ is $1.4 \times 10^{4}$ man-rem (shown incorrectly in the table as bone dose for $^{137}Cs$.

L-74 29. page V-45 - Table V-33. What population size was assumed? What fraction was assumed released to the Tuscaloosa Aquifer? To the atmosphere?

The population size is stated in the text immediately preceding the table as 50,000 potential future onsite users. As stated in the text, release fraction and other details are not presented due to classification.

L-75 30. page V-46 - The concept of a maximum individual dose should be applicable. The stated average individual doses of 150 rem seem to be clearly acceptable.

The concept of maximum individual exposure is not applicable to this sabotage event because of the time scale involved and the population distribution/water use scenario. Whether or not a consequence of 150 rem to some individuals is acceptable depends upon the probability of occurrence and the number of individuals. The document makes no judgments regarding acceptability.

L-76 31. page V-46 - The probability that a terrorist could be able to sabotage the facility in the absence of security is given as 10. This seems very low. Also the possibility that a terrorist group ("smaller than a small army") could overcome the security is apparently considered negligible. These assumptions need further explanation.

The probability of sabotage cannot be determined; however, it is assumed to be low. The probability that a terrorist group could perform a successful sabotage in the presence of security is given on page V-45 as $10^{-5}$. The probability that a terrorist group could perform a successful sabotage in the absence of security and radiation monitoring is given on page V-46 as $10^{-3}$. A $10^{2}$ attenuation is attributed to the security force.

L-77 32. page VI-1 - Possible degradation of glass (devitrification) or concrete has been ignored.

Degradation of waste forms would only be expected if they are exposed to high temperatures and pressures for extended time periods. This phenomenon is not expected to affect the risk analysis of offsite transportation.

L-78 33. page VI-2 - Table VI-2. Total canister miles for 3000 mile distance is acceptable. However, that for 1500 is not understandable.

There were errors in the composition of the table. The correct values for 1500 mi are $0.8 \times 10^{7}$ for glass; $1.2 \times 10^{7}$ for concrete; $1.2 \times 10^{7}$ for dry powder; and $2.0 \times 10^{7}$ for fused salt. These typographical errors do not affect the results of the analysis.

L-79 34. page VI-6 - Tables VI-4 and VI-5. Except for drivers and crew the total dose in man-rem (Column 2) appears to be in error. Are there other factors not mentioned in the text?

There were several typographical errors in Table VI-4. The corrected values for Table VI-4 are given in the following table:

Corrected Values for Table VI-4

| | | |
|---|---|---|
| 2 | $9.2 \times 10^{-2}$ | $4.6 \times 10^{-2}$ |
| 2 | $7 \times 10^{-4}$ | $3.5 \times 10^{-4}$ |
| 6,875 | $4.3 \times 10^{-2}$ | $6.5 \times 10^{-6}$ |
| 10 | $9 \times 10^{-3}$ | $1.8 \times 10^{-3}$ |
| 85,000 | $2.3 \times 10^{-3}$ | $1.2 \times 10^{-7}$ |

Also, the maximum individual dose to brakemen in Table VI-5 should be $7.5 \times 10^{-4}$ instead of $1.5 \times 10^{-3}$, and the last value in Table VI-5 should be $4.8 \times 10^{-7}$ instead of $4.8 \times 10^{-5}$.

The population doses for traffic and onlookers were calculated assuming all persons in one of these categories was exposed to the same radiation field as described in the text. On this basis, all people in the category would receive the same dose, and the total population dose for the category would equal the number of people exposed times the dose determined for each person in the category. This average individual dose is not reported in Tables VI-4 and VI-5, but can be obtained by dividing the Total Population Dose for a category by the number of people exposed in the category. However, an estimate was made of the maximum individual dose for the categories. These qualitative estimates of maximum individual dose are given in Tables VI-4 and VI-5. It is emphasized that the population dose for traffic, onlookers, and general public will, therefore, not equal the population times the maximum individual dose.

L-80 35. page VI-13 - Table VI-13. Maximum individual dose to lung from $^{137}Cs$ should be 1.2 not 0.12. Add population size to footnote.

The dose should be 1.2 and this was a typographical error and does not affect the analysis. Population size is 203,000.

L-81 36. page VIII-4 - Table VIII-1. Footnote a. The ratio of 1/6 only applies when the dose to bone and whole-body are equal. For example a $^{90}Sr$ dose commitment to the whole-body of 1 rem would result in a dose to the bome of 400 rem. The ratio for Pu is 40. Therefore, to normalize for health effects each nuclide would have to be considered individually, i.e., 1 rem whole-body would be equivalent to 66 rem (400/6) to bone for $^{90}Sr$ and 6.6 rem (40/6) for Pu.

Radiation dose to the bone, regardless of radionuclide delivering the dose, is assumed to be one-sixth as effective in producing health effects as an equivalent dose to the whole body. Thus, to obtain an "equivalent" whole body dose, the bone dose was divided by 6 and then added to the true whole body dose. For purposes of comparing health effects of the various plans considered, this is considered to be an adequate approximation. (See page X-7 of ERDA 77-42/1)

L-82 37. page VIII-9 - Table VIII-3. Exponent errors.

These were typographical errors and do not affect the analysis. Correct exponents are for $^{238}Pu$: $8.3 \times 10^{-5}$ and for $^{239}Pu$: $1.0 \times 10^{-6}$; $3.0 \times 10^{-5}$ and $3.7 \times 10^{-3}$.

L-83 38. page VIII-13 - Sabotage. The total environmental dose commitment should be addressed.

The dose commitment to the maximum individual and to the population is addressed in Tables VIII-6 and VIII-7 of ERDA 77-42.

L-84 39. page VIII-14 - Table VIII-8 gives the areal ground levels for several radionuclides out to 60 km. What would be the potential effect through the milk pathway for $^{137}Cs$ and $^{90}Sr$? Since a sabotage event could occur at any particular time, what would be the commited man-rem dose to the population of Augusta if it happened to be in the prevailing wind direction?

See response to Comment L-83. Also, as indicated in response to Comment L-70, the most populous sector, which includes Augusta, was used to calculate population doses.



L-85 40. Appendix A

page A-3. The 1080 Ci/yr of tritium will not be retained in the seepage basin, but an equivalent amount will be released to and/or exchanged at the water-air interface. An equilibrium inventory will, however, build-up and approach 5000 Ci if operations were to continue for about 10 years. During the proposed 5 years of solidification operations about 4220 Curies will accumulate in the basin. Refer to comments under appendix B for a reference regarding tritium releases at Savannah River.

DOE agrees that tritium will not be retained in the seepage basins. As indicated in the response to the comment on the same subject (L-95), DOE would assume 30% of the tritium released to the seepage basin should be evaporated or exchanged and become airborne. This is equivalent to 530 Ci/yr and this amount should be removed from the 1080 Ci/yr retained in the seepage basin.

L-86 page A-10. Table A-6. Table is incorrect. Activity abandoned in place should be given in total curies, not Ci/year. The total tritium inventory in the basin at the end of 5 years would be determined as follows:

Input rate to basin, I = 1780 Ci/yr
fractional release rate, $\lambda$ = 0.35 yr
(From Figure B-3)
then the total inventory (Q) at any time, t, is given by the relationship

$$Q = \frac{I}{\lambda} (i-e)^{-\lambda t}$$

after 5 years

$$Q = \frac{1780 \text{ Ci/yr } (0.83)}{0.35 \text{ yr}^{-1}}$$

$$Q = 4220 \text{ Ci}$$

Both Tables A-1 and A-6 show the rate of activity abandoned in place for each year of operation. It is obvious then that if the process is operated 5, 10, or 20 years, the accumulation will be larger than that shown in Tables A-1 and A-6. Also, see response to L-88.

L-87 For the case of Strontium and tritium these would indeed be expected to reach the creeks at a rate given in Appendix B, figure B-3.

A comparison between Tables A-1 and B-1 will show that the amount of strontium and tritium reaching the creeks will be lower for the concrete plant than for the F and H canyons.

L-88 page A-11. Table A-7. Should be the total inventory in Curies at the time of abandonment, not Ci/yr. If the 1060 Ci of tritium was determined in the same manner as was Table A-6, then it is incorrect as would be the activity for the other nuclides listed.

At the time of preparation of this appendix, it was elected to express the risk of activity abandoned on a yearly basis. Selection could have been on an assumed campaign basis but the assumption on campaign length would introduce additional uncertainty.

L-89 page A-13. Pathways to man. It may be of little significance in comparison to the dose from immersion and inhalation, but deposition onto vegetation by impaction will occur regardless of particle size especially under windy conditions.

DOE agrees that deposition on vegetation is small and therefore not included in this discussion.

L-90 page A-18. Table A-12. $^{90}Sr$ and $^{137}Cs$ should be included. Footnote b not applicable to this table.

$^{137}Cs$ is included on Table A-12. No $^{90}Sr$ was released via this path thus Table A-12 does not shown $^{90}Sr$. DOE agrees with EPA that either footnotes should be included.

L-91 table A-11. Independent dose commitment calculations differ considerably (higher) than those stated in the table. Particularly for $^{90}Sr$ in bone.

DOE is not familiar with the independent dose commitment calculations referred to by EPA. Therefore, no response is offered. DOE dose calculation methodology was addressed by response to comment L-47.

L-92 page A-19. Table A-13. Would tritium be of any significance here?

Tritium will not be significant here because tritium content of the SRP high-level waste is very low (Table III-7 of ERDA 77-42).

41. Appendix B

L-93 Page B-3

table B-1. The last two columns in the fourth table are in error. The activity abandoned in place in the seepage basins must be in terms of total activity, not Ci/year. If the source terms in Table B-9 and the release rates in Figure B-3 are correct, then the total activity for tritium would be determined as follows:

The last two columns in the fourth table were prepared to show the risk of operating F and H canyons for an average year and is based on measured data for the years 1968-1974. The tables are structured in this fashion as indicated on page B-1 to serve as data input to determine the risk from the solidification plant. These tables are not in error.

DOE agrees that after long periods of operation the 15,700 Ci of tritium shown in Table B-11 does not represent an equilibrium value. Table B-11 gives the component of activity abandoned in the seepage basin from an average year of operation of the F and H Area canyon processes. As indicated above, this value was identified to serve as a basis for estimation of a comparable value for the solidification plant.

Source Term, I = 26,200 Ci/year

Fractional release rate, $\lambda = 0.35\ yr^{-1}$ ($T_{1/2}$ = 2 yrs)

At equilibrium the source term must equal the release rate (I=R) so that the total quantity (QA) of tritium in the basin at anytime, and at the instant of input termination would be:

$$Q = \frac{I}{\lambda}$$

$$Q = \frac{26{,}200\ Ci/yr}{0.35\ yr^{-1}}$$

$$Q = 75{,}000\ Ci\ --\ not\ 15{,}700\ Ci$$

Similar calculations may be made for the other isotopes.

L-94 table B-2 and B-3. These are duplications of data presented in Table B-1.

Table B-1 is intended as a summary table and does include data from other tables in the Appendix.

L-95 Page B-11

Assuming that all of the strontium is in the form of $^{90}Sr$ and by using the fractional release rate from figure B-3 ($0.1\ yr^{-1}$), then the equilibrium inventory in the seepage basin would be:

$$\frac{2.1\ Ci/year}{0.1\ yr^{-1}} = 21\ Ci$$

If 5% of this is assumed to reach the stream, then 1.0 Ci/year would be a conservative figure to use.

The response to this comment is the same as the response to the comment on tritium abandoned in place above.

L-96 It is stated that 40% of the annual tritium input (10,500 Ci) migrates to the stream. This leaves the remaining 60% unaccounted for. This amount (15,700 Ci) is released to the atmosphere at the surface - air interface of the seepage basin. This should be mentioned under atmospheric releases. (Reference: - Horton, J. H., et col. Vol. 5, No. 4, April 1971). Environmental Science & Technology.

Of the 26,200 Ci/yr tritium released to the seepage basin (Table B-9), 10,500 Ci/yr was released to plant streams (Table B-6), and 15,700 Ci/yr listed on Table B-10 is assumed to be abandoned in place. EPA is correct. Some of this tritium activity would be released to the atmosphere from these seepage basins. This has been determined to be about 30% of the tritium input or about 7,800 Ci/yr and would reduce the amount abandoned in place by a like amount. In determining the offplant releases and dose commitment for operation of the F and H canyons, this results in only a fraction of the releases and dose commitment. For example, for the year 1978 this pathway accounted for seven man-rem dose commitment to the 100 km population surrounding the F and H canyon facilities.

Page B-13

L-97 table B-10. The last two columns in this table are in error. Refer to comment under page B-3.

As indicated in the response to the previous EPA comment (L-93). DOE does not consider the last two columns on Table B-10 to be in error.

Page B-14

L-98 The data presented in Table B-11 are incorrect. This is not the activity that remains in the seepage basin. As mentioned earlier, the 15,700 Ci of tritium is the amount of tritium that is exchanged with atmospheric $H_2O$ at the basin surface. The actual tritium inventory at the cessation of operations would be 75,000 Ci. The rate of removal after abandonment would depend upon whether or not the basin were covered. If uncovered, the tritium inventory would be removed at the fractional rate of 0.35 $yr^{-1}$ (Figure B-3). If covered, then at the rate of 0.14 $yr^{-1}$ (10,500 Ci/yr 75,000 Ci).

The release and/or decay of the other radionuclides in Table B-11 will also be a function of the release rates given in figure B-3, but should not be significantly affected by a covering.

As indicated in the response to the Comment L-96, the 15,700 Ci of tritium assumed to be abandoned for each year of operation does include 7,800 Ci of tritium that is expected to evaporate or exchange with $H_2O$ in the air and become airborne. Other radionuclides actually represent amount of activity that would be abandoned in place.

Radionuclides shown on Table B-11 (other than tritium and $^{90}Sr$) would be retained in the basins and decrease as shown on Figure B-3 due to decay only. $^{90}Sr$ would slowly migrate through the soil between the seepage basins and the streams. The rate of migration would depend upon the amount of water reaching the area of the seepage basin. As indicated above, if the basins were filled and protected from in-leakage of water, the rate of movement of this $^{90}Sr$ would decrease and become only that associated with decay.

Page B-16

L-99 Some typographical errors appear in figure B-3. Cesium and Strontium should not appear in the total beta curve, since they are identified independently. Also the $^{89}Sr$ curve would be different from the $^{90}Sr$ curve due to its much shorter half-life.

DOE agrees that cesium and strontium should not be listed following the total beta on figure B-3. $^{89}Sr$ and $^{90}Sr$ were combined on the $^{89,90}Sr$ curve because no separation between the two radionuclides of strontium was made in determining source data (Table B-8). In preparing Figure B-3, the more conservative assumption was made that all of this strontium was $^{90}Sr$, which has the longest half-life.

Page B-19

L-100 Paragraph titled "Canyon accidents not resulting in release to the environment" refers to Table B-14 which lists five accident situations which could possibly lead to potential environmental releases. This paragraph needs further explanation of the assumptions used to reach this conclusion.

The results presented in Appendix B are summarized from the probabilistic risk evaluation in the reference (DPSTSA-200-1). All of the canyon accidents addressed in the reference document are summarized in Table B-14. Appendix B addresses the canyon accidents which would result in a release to the environment on pages B-4 through B-19. The section entitled, "Canyon Accidents not Resulting in a Release to the Environment" is included to address all of the accidents which were not included in the earlier Appendix B discussions because they result in no release to the environment.

D-ERD-A00126-SC
*UNITED STATES ENVIRONMENTAL PROTECTION AGENCY*
WASHINGTON, D.C. 20460
Apr 25, 1977

Mr. W. H. Pennington
Director, Office of NEPA Coordination
U.S. Energy Research and Development
Administration
Washington, D.C. 20545

Dear Mr. Pennington:

The Environmental Protection Agency has reviewed the draft environmental statement issued by the Energy Research and Development Administration entitled, "Waste Management Operations at Savannah River Plant (SRP), Aiken, South Carolina (ERDA-1537)." The stated purpose of the draft statement was to provide a detailed analysis of the actual and potential environmental effects associated with waste management operations at the Savannah River Plant.

We were pleased to note that both the history of Waste Management Operations and the Future Waste Management Program were very candidly presented in the appendices. EPA is encouraged to see this type of information and we welcome the opportunity to review the documents being prepared for the SRP, Hanford, and Idaho installations on *alternative methods for long-term management of high-level* radioactive wastes at these three sites. Such work will not only help to resolve the waste management problems at Federal facilities, but the information should be helpful in solving the commercial waste management problem as well.

In December 1973, EPA commented and provided suggestions with respect to Federal Register Notice 38 FR 2195. In particular, we indicated the subjects we believe necessary for inclusion in the environmental impact statement being prepared for the Hanford Facility. The comments which follow are supplemental to those above and are based on the assumption that production operations and radioactive releases at SRP will continue at about their present level for the foreseeable future.

As a part of the waste management plan at SRP, it is stated that the "waste management operations use only a small fraction of the plant site and that this fraction will require surveillance and control for the foreseeable future; and further that decommissioning will be addressed as part of the longer range waste management program." Although EPA agrees that there should be a long-range plan for nuclear waste management and decommissioning of facilities, assessment of the impacts of decommissioning should be done at the same time the necessary funding is allocated.

Responses are given on pages K-29 through K-34 of ERDA-1537.

The draft statement indicates that the "R" and "L" production reactors are in "stand-by" condition. If the production of weapons materials at SRP will in fact be maintained at the present level, it could be assumed that decommissioning of these units is a very real possibility. Thus, the final statement should give a more detailed plan for these stand-by units and if they are eventually to be decommissioned, this should be clearly stated and procedures and time-tables representing the decommissioning effort provided.

The various reviews of the SRP wasge management plan indicate that bedrock storage remains a possible option for long-term waste storage at SRP. In commenting on the draft EIS for Bedrock Disposal in March 1972, EPA expressed its grave concerns regarding the potential environmental impact of this disposal option. If bedrock storage is still a viable option, then it should be more specifically addressed, with particular attention paid to the question of isolating shafts and tunnels from the Tuscaloosa aquifer, the principal water supply for most of southeastern Georgia. It is EPA's opinion, however, that further investigation is needed to define more precisely such factors as the geological and hydrological conditions that determine the usefulness of sites such as SRP for waste disposal and to better determine the effects of heat and radiation on the enclosed rock media.

Including the general comments and concerns stated above, EPA has the following specific comments:

1. Page III-32: "...individuals served by the water treatment plants consume 1200 ml of water each day." Doses are calculated based on this level of consumption. Since, however, the Drinking Water Standards are based on 2 liters/day consumed, the impact assessment should be readjusted to reflect this higher volume.

2. Page III-28: "...dose commitment means radiation dose equivalent that will be received in a lifetime (70 years) by population groups..." We believe this method does not reflect the total environmental impact. It is EPA's position that the potential total environmental impact in subsequent years is best estimated by calculating the "environmental dose commitment," the sum of all doses to individuals over the entire time period that radionuclide persists in the environment in a state available for interaction with humans. The environmental dose commitment is usually expressed for a period of 100 years recognizing that it is difficult to estimate the population growth much beyond this time period.

3. Page I-12: "...long-term offsite effects of SRP releases to the surrounding population will be much smaller than the effects in the year of actual release..." This statement should be clarified since cancer has a long latency period.

4. Tables III-33 and III-34 appear to imply that the total whole body population doses from atmospheric releases from Vogtle Nuclear Plant (VNP), Barnwell Nuclear Fuel Plant (BNFP), and Savannah River Plant (SRP) should be additive since the plant sites are so near to one another. The inference drawn from these tables is that BNFP operations would have a significant effect on the whole body population dose from atmospheric releases as compared to the corresponding dose calculated for SRP in 1975. We would suggest that two scenarios be offered, one with SRP doses and another with combined doses from BNFP, VNP, and SRP. This would give a broader spectrum of possible off-site population doses.

In light of our review and in accordance with EPA procedure, we have rated the Savannah River waste management operations as LO (Lack of Objections) and classified the draft statement as Category 2 (Insufficient Information). If you or your staff have any questions concerning our classification or comments, please don't hesitate to call us.

Sincerely yours,

Rebecca W. Hanmer
Director
Office of Federal Activities (A-104)

104 Davey Lab.
Penn. State University
University Park, Pa.
16802
13 November 1978

W. H. Pennington
Mail Station E-201, GTN
Department of Energy
Washington, D.C., 20545

Dear Mr. Pennington:

Enclosed are my comments on the Draft Environmental Impact Statement, Long - Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant, DOE/EIS-0023-D. Please note that the opinions expressed are not necessarily those of The Pennsylvania State University.

Table IV-6 presents the total activity of several isotopes, and is very useful. I note that the listed activity for $^{90}Sr$ is $1.3 \times 10^8$ curies, wheras Krugmann and von Hippel (Science, 197, P 883-885, 26 August 1977) reach an estimate
M-1 of $1.6 \times 10^8$ curies at a somewhat earlier date. I would ask that table IV-6 be expanded to show all the isotopes listed in tables IV-3 and IV-4.

The total $^{90}Sr$ activity in reconstituted waste listed in Table IV-6 is based on analyses of representative high-level sludge samples and is shown corrected for decay through 1985.

Table IV-6 is shown as a summary of the most important radioisotopes as an aid to the reader who may not be interested in the detail given in Tables IV-3 and IV-4.

M-2 There is an obvious misprint at the top of page B-5. Also, the last line on page B-7 lists the half life of $^{129}I$ incorrectly.

The misprint on page B-5 of the draft EIS has been corrected in the final EIS (EPA was changed to ERDA). The half-life of $^{129}I$ was corrected from $1.6 \times 10^7$ years (in the draft EIS) to $1.7 \times 10^7$ years in the final EIS.

I received my copy of the Draft EIS on 2 November, and have put this together as quickly as possible.

Sincerely,

W.A. Lochstet

Radiological Impact of
Long-Term Management
of Defense High-Level
Radioactive Wastes
Savannah River Plant
by
William A. Lochstet
The Pennsylvania State University*
November 1978

M-3 The draft Environmental Impact Statement on the long - term management of high-level radioactive wastes at the Savannah River Plant (Ref. 1) attempts to evaluate the public health consequences of the disposal of this waste. Some of this information was discussed in a previous report of ERDA (Ref. 2). The consequences are evaluated for a population within a 150 km radius of SRP for the first 300 years. It is suggested that radiation exposures outside these limits can be ignored, and that the consequences inside this bound are minimal (Ref. 1).

It is suggested that the linear, non-threshold hypothesis for the relation of health consequences to radiation exposure is a gross overestimation of the consequences. The justification for this position is the January 1975 Report No 43 of the National Council on Radiation Protection (NCRP) (Ref. 1, P XII -1 to XII -2 and P XII -12). This position is not supported by subsequent research. The August 1975 Report of K.Z. Morgan (Ref. 3) argues that the linear hypothesis is not conservative and points to a report of Baum which showes health effects proportional to the square root of the dose. This arguement was presented in a discussion of alpha emitting nuclides. An earlier report (1970) of Stewart and Kneale had established linearity to X - ray exposure for infants (Ref. 4). The BEIR II report of 1977 (Ref 5) used the linear non-threshold hypothesis for its evaluation of the cost-benefit analysis of medical x-rays. The report of Mancuse et al. (Ref. 6) suggests that for protracted doses, the doubling doses for some cancers are only a few rads. This is a much larger effect than would be expected from the high dose data. Perhaps the upcoming report of the BEIR committee will address this area. In the meantime, lacking any guidance as to how non-conservative the linear non-threshold theory is, or what exact hypothesis is appropriate, the linear, non-threshold hypothesis should be used for public health purposes, and will be used here.

* The opinions and calculations contained herein are my own, and not necessarily those of The Pennsylvania State University. My University affiliation is given here for identification purposes only.



Recently, much literature has dealt with the prediction of health effects from low levels of ionizing radiation. The most broadly accepted reports on these effects are the BEIR Report (1972) by the National Academy of Sciences and the UNSCEAR Report (1977) by the United Nations Scientific Committee on the Effects of Atomic Radiation. The National Academy of Sciences is currently preparing to release an update of the BEIR Report.

This environmental statement adopts the linear dose-health effect relationships derived from the BEIR Report by the Environmental Protection Agency (EPA). No threshold dose is assumed for health effects. These dose-effect estimates are quite uncertain and may or may not overestimate the actual effects. The following is a quote from the EPA analysis of the fuel cycle ("Environmental Analysis of the Uranium Fuel Cycle," EPA-520/9-73-003B):

> "The numerical risk estimates used are primarily from the BEIR Report. What must be emphasized is that though these numbers may be used as the best available for the purpose of risk-cost benefit analyses, they cannot be used to accurately predict the number of casualties. For a given dose equivalent, the BEIR Report estimates a range for the health impact per million exposed persons. For example, the BEIR results from a study of the major sources of cancer mortality data yield an absolute risk* estimate of 54 to 123 deaths annually per $10^6$ persons per rem for a 27-year followup period. Depending upon the details of the risk model used, the BEIR Committee's relative risk** estimate is 160 to 450 deaths per $10^6$ persons per rem. It is seen that the precision of these estimates is at best about a factor of 3 to 4, even when applied to sample populations studied on the basis of the same dose rates. The application of the BEIR risk estimates to exposures at lower dose rates and to

* Absolute risk estimates are based upon the reported number of cancer deaths per rad that have been observed in exposed population groups, e.g., Hiroshima, Nagasaki, etc.

** Relative risk estimates are based upon the percentage increase of ambient cancer mortality per rem.

M-3 contd

population groups more heterogeneous than those studied increases the uncertainty in the risk estimates. Considering the limitations of presently available data and the lack of an accepted theory of radiocarcinogenesis, emphasis should be placed on the difference in risk estimates between the various procedures and countermeasures discussed in this report rather than on the absolute numbers. Where the absolute numbers must be used for risk-cost-benefit balancing, it should be revised as new information becomes available. Notwithstanding these disclaimers, it is also pertinent to note that we are in a better position to evaluate the true risks and the accompanying uncertainties from low levels of radiation than from low concentrations of other environmental pollutants which might affect populations...."

The somatic dose-effect relationship factors derived by the EPA are neither upper nor lower estimates of probability but are computed on the same basis as the probability characterized as "the most likely estimate" in the BEIR Report; that is, they are averages of the relative and absolute risk models considered in the BEIR Report.

Concerning genetic effects of radiation, the EPA position is that the range of risk estimates set forth in the BEIR Report is so large that such risks are better considered on a relative basis for different exposure situations than in terms of absolute numbers. The range of uncertainty for the "doubling dose" (the dose to double the natural mutation rate) is 10-fold (from 20 to 200 rads); and because of the additional uncertainties in 1) the fraction of presently observed genetic effects due to background radiation, and 2) the fraction of deleterious mutations eliminated per generation, the overall uncertainty is about a factor of 25. The EPA uses a value of 200 serious genetic effects per $10^6$ person-rem. This value may either underestimate or overestimate the genetic effects of radiation because of the uncertainties involved.

Integration of the population exposures through 10,000 years has been added to Section V-C.3 of the EIS. The results of this integration show the small additional impacts of the long-lived isotopes.

M-4 It is suggested that the Sr, Cs and Pu in the SRP waste could be processed into a glass and disposed of in a geological formation (Ref. 1). It has been recently pointed out by McCarthy et al (Ref. 7) that under the conditions expected during the first few years of such burial, that such glass would disintegrate. Furthermore, the dependability of the geological barrier to provide isolation has been found inadequate by the USGS (Ref 8) and by the EPA (Ref. 9). The disposal of a glass waste form in a geological depository must be reevaluated.

Section IV of the final EIS has been expanded to include more information on alternative waste immobilization forms. Although this section concludes that borosilicate glass appears to be a satisfactory waste form for SRP wastes under the expected repository conditions, other waste forms are being evaluated. It is expected that the final waste form decision will be made in 1984 considering the compatibility of the waste form with the host rock and with the container and engineered barrier materials. The proposed R&D program will be undertaken with sufficient flexibility so as not to foreclose any reasonable alternative waste forms under consideration prior to completion of a project-specific environmental review. A large R&D program is being conducted on other advanced waste forms at a variety of national laboratories, universities, and industrial plants.

Evaluation of the dependability of geological barriers is beyond the scope of this EIS. Future environmental analyses will address the options for disposal of SRP wastes, including the dependability of geologic barriers.



M-5 It has been suggested that after 300 years, the wastes become harmless. There are some very long half lives involved, such as the $1.7 \times 10^7$ years of $^{129}I$. Further the law requires full consideration for such a long time period. Footnote 12 of NRDC v. USNRC, 547 F. 2nd 633 (D.C. Cir. 1976), states in part:

> We note at the outset that this standard is misleading because the toxic life of the wastes under discussion far exceeds the life of the plant being licensed. The environmental effects to be considered are those flowing from reprocessing and passive storage for the full detoxification period.

This portion was upheld in Vt. Yankee Nuclear Power v. Natural Res. D.C., 98 S.Ct.1197, 1209 (1978). Thus the full time period of the radioactive decay must be considered. There is no comparison made with background. The existance of severe health consequences from background radiation in no way invalidates the health consequences due to SRP wastes.

As examples, some of the consequences of two isotopes present in SRP wastes $^{129}I$ and $^{238}U$ will be considered. The total quantity of waste to be generated at SRP is taken to be $80 \times 10^6$ gallons (Ref. 2, P I - 7) without evaporation in the year 1985.

In the final EIS, integrated population exposures were included for a time period out to 10,000 years (see Section V-C of the final EIS). The period of maximum risk is before $^{90}Sr$ and $^{137}Cs$ have decayed (300 years). The integrated impact out to 10,000 years shows the small additional impact of the long-lived isotopes.

M-5 contd The 80 x $10^6$ gal. of waste produced at SRP contained a concentration of $^{238}U$ of 6 x $10^{-7}$ Ci/gal. (Ref. 1, P. IV-3). This implies a total of 480 curies or 1.4 x $10^6$ kg of $^{238}U$. Recently, Kenford (Ref. 13) has pointed out the importance of the subsequent decay thru radon - 222. This has also been reviewed by R.L. Gotchy of the NRC staff (Ref. 14). This decay of the $^{238}U$ will ultimately produce a total of 2 x $10^{14}$ curies of $^{222}Rn$. If the $^{238}U$ is deposited in a cavern under SRP it is expected to be only 1500 feet below the surface (Ref. 1, P IV-17). This is fairly good protection against erosion, but it should be noted that the grand canyon is three times as deep. It is impossible to be certain of the fate of such material over very long time periods. It will be assumed that on the average this material will be at the surface about 1/2000 of the time, and thus, the radon will be free to escape into the atmosphere. To provide a basis for estimate it is assumed that the world population remains at its current level. The NRC has recently done this, assuming a U.S. population of 300 million (Ref. 14, P.3) with the result that the release of 1 curie of $^{222}Rn$ from a typical mill tailings pile in a western state will result in a total dose of 0.56 person - rem to the bronchial epithelium, for the total population. Thus the expected dose is 5.6 x $10^{10}$ person - rem to the bronchial epithelium. The NRC estimate of cancer risk is 22.2 deaths per million person-rem to the bronchial epithelium. (Ref. 14, P. 7). Even though this estimate is too low it will be used here. The result is an expectation of 1.2 x $10^6$ cancer deaths.

These million deaths are attributable to the SRP wastes. The fact that more people will die of other causes in no way effects this estimate, or its result to these people. If an added burden is made to the radiation exposure, it must be considered, regardless of how small. To ignore it would produce an invalid cost - benefit analysis. In Calvert Cliffs Coordinating Committee v. USAEC, 449 F. 2nd 1109 (D.C. Cir., 1971) the court stated:

> We conclude, then, that Section 102 of NEPA mandates a particular sort of careful and informed decision - making process and creates judicially enforcable duties .... But if the decision was reached procedurally without individualized consideration and balancing of environmental factors -- conducted fully and in good faith -- it is the responsibility of the courts to reverse. (emphasis added)

Thus, these matters must be considered fully and honestly.

Our analysis of the impacts due to bedrock disposal do not assume that the bedrock caverns is ever exposed to the atmosphere. We know of no way to predict this occurrence nor to support the assumption that the wastes would contact the air 1/2000 of the time over the next 4.5x$10^{10}$ years (10 half lives of U-238). We also cannot envision a pathway for the entire population of the U.S. to be uniformly exposed to any release of Rn-222 from the SRP bedrock, much less constantly over hundreds of years. Our conservative analysis of the health effects of bedrock disposal predict 28 possible health effects over a 10,000-year period.

M-5 contd

The average concentration of $^{129}I$ in fresh SRP waste is given as $1 \times 10^{-6}$ Ci/gal (Ref. 1, P IV-3). With a total volume of $80 \times 10^{6}$ gal as presented above, the total $^{129}I$ activity is 80 curies. To simplify matters, suppose that these 80 Ci become uniformly diluted in the stable iodine of the biosphere. I suggest that this may be due to the failure of the geological containment after a mere million years and another million years is required to wash away the waste. There may be as much as $100 \times 10^{9}$ metric tons of iodine available to the biosphere. This defines a steady state concentration diminished only by radioactive decay. The iodine content of a standard thyroid is 7 milligrams (Ref 10). From this, the activity in a standard thyroid can be found, and in turn, using the methods of ICRP publications 10 and 2 (Refs. 10 and 11) the dose is obtained. If the world population is assumed to remain at its present number of 4 billion the total dose can be found. If this summed over the total decay of the $^{129}I$, the result is $3.4 \times 10^{7}$ person-rem to the thyroid. Following the method of EPA (Ref. 12, P.D-17) which uses the linear non-threshold hypothesis to estimate cancer risk, a total of 340 to 450 thyroid cancers is estimated. At current rates, 57 to 110 of these would be fatal. This should be added to the estimate of $6.1 \times 10^{5}$ person-rem in the case of abandonment (Ref. 1, P. XII-14) which would yield 122 dead using the factor of 200 deaths per $10^{6}$ person-rem (Ref. 1, P. I-3).

We know of no pathway which would result in the uniform distribution of approximately 500 kg of I-129 in the biosphere of the entire earth, especially if that I-129 is in a large mixture of radioactive wastes within a bedrock cavern.

References


1 "Draft Environmental Impact Statement, Long-Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant" DOE/EIS-0023-D, Draft, Department of Energy, July 1978

2 "Environmental Statement, Waste Management Operations, Savannah River Plant", ERDA - 1537, Energy Research & Development Administration, September 1977

3 "Suggested redustion of permissable exposure to plutonium and other transuranium elements" K.Z. Morgan, American Industrial Hygiene Association Journal, 36, P567 - 575, August 1975

4 "Radiation Dose Effects in Relation to Obstetric X-rays and Childhood Cancers", Alice Stewart and G.L. Kneale, Lancet, 1970, P. 1185-1188.

5 "Considerations of Health Benefit-Cost Analysis for Activities Involving Ionizing Radiation Exposure and Alternatives", National Academy of Sciences, BEIR II Report, 1977

6 "Radiation Exposures of Hanford Workers Dying from Cancer and other Causes", T. Mancuso, A. Stewart and G. Kneale, Health Physics, 33 P 369-385, 1977

7 "Interactions between Nuclear Waste and Surrounding Rock", G. H. McCarthy et al, Nature, 273, P. 216-217, 1978

8 "Geologic Disposal of High-Level Radioactive Wastes - Earth-Science Perspectives" USGS, Circular 779, 1978

9 "State of Geological Knowledge Regarding Potential Transport of High-Level Radioactive Waste from Deep Continental Repositories", EPA/520/4-78-004, EPA, 1978

10 International Commission on Radiological Protection, Publication No. 2, Pergamon Press, 1959

11 International Commission on Radiological Protection, Publication No. 10, Pergamon Press, 1968

12 "Environmental Radiation Dose Commitment: An Application to The Nuclear Power Industry", EPA-520/4-73-002, EPA, 1974

13 Testimony of Dr. Chauncey R. Kepford, "Health Effects Comparison for Coal and Nuclear Power: in Three Mile Island (No. 50-320) operating license hearings, and portions of transcript related, in which the NRC staff supports his numbers.

14 Affidavit of R.L. Gotchy, "Appendix", "Radiological Impact of Radon - 222 Releases", USNRC, in the matter of Three Mile Island Unit 2, (Docket No. 50-320), January 20, 1978

NINETY-FIFTH CONGRESS
CONGRESS OF THE UNITED STATES
HOUSE OF REPRESENTATIVES
Environment, Energy, and Natural Resources
Subcommittee
of the
Committee on Government Operations
Rayburn House Office Building, Room B-371-D-C
Washington, D.C. 20545
October 12, 1978

Honorable James R. Schlesinger
Secretary
Department of Energy
Washington, D.C. 20545

Dear Mr. Secretary:

N-1 I am in receipt of your draft environmental impact statement entitled "Long-Term Management of Defense High-Level Radioactive Wastes," which is dated July, 1978. I find this EIS to be deficient in facts and analysis.

For example, if one reads the alternatives with care, it appears that there is hardly any difficulty in providing a technological fix to the waste problem. All we need to do is select one, which may or may not have more risk associated with it.

The description of the technology leads one to believe that the technology is proven. There is little there to indicate that many of the assumptions about the technology are merely hypothetical. For example, there is now serious and growing debate about the long-term safety of processing the waste to glass. Apparently, recent research has shown that vitrification of nuclear wastes is not considered to be a solution now, which is not indicated in your EIS.

N-2 There are questions about salt dome storage as well. This was brought out very clearly in a recent GAO report.

The document has been revised with the addition of Section IV D to cover the subject of alternative waste immobilization forms. Although this section concludes that bonosilicate glass appears to be a satisfactory waste form for SRP wastes under the expected repository conditions, other waste forms are being evaluated. It is expected that the final waste form decision will be made in 1984 supported by another environmental review. The proposed R&D program will be undertaken with sufficient flexibility so as not to foreclose any of the reasonable alternative waste forms under consideration prior to completion of a project-specific environmental review.

The status of technology of the various ultimate waste disposal alternatives is covered in the reference "Draft EIS, Management of Commercially Generated Radioactive Waste," DOE/EIS-0046-D (April 1979), as indicated in Section V-G. The method for disposal of the SRP wastes subsequent to immobilization will be the subject of a future environmental review and is not in the scope of the EIS. The proposed R&D program is sufficiently broad in its initial stages that the only disposal alternatives which would be foreclosed are rock melting and reverse well disposal which are represented by Alternative 3 in this EIS.

N-3 This EIS raises more questions than it addresses. There is a significant amount of on-going R&D in the nuclear waste management area that isn't reflected in this EIS, e.g. work in ceramics and synrock. In fact, this EIS seems to be oblivious to current work and may have been written ten or so years ago.

Advise me as to how this EIS will be rewritten and what alternatives will be considered.

Sincerely yours,

LEO J. RYAN
Chairman

R&D on synrock, ceramics, and other alternative waste forms has been included as Section IV-D of the final EIS.

UNITED STATES DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240
ER 78/763
Oct 20, 1978

Mr. W. H. Pennington, Director
Division of Program Review
and Coordination
Office of NEPA Affairs, EV
Department of Energy
Washington, D. C. 20545

Dear Mr. Pennington:

O-1 Thank you for your letter of July 31, 1978, transmitting copies of the Department of Energy's draft environmental impact statement for Long-Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant, Aiken and Barnwell Counties, South Carolina.

Our comments are presented according to the format of the statement or by subject.

General

No discussion was found of the possibility that the waste may have value as a source of rare isotopes at some future time. Possibly this consideration should be included among the "difficult-to-quantify" factors that are summarized on Table I-2. If this is a credible possibility, it would probably be evaluated in the same way as the factor identified as "Potential for regrets if future economics or technology indicates a better method." That factor might simply be reworded to include both considerations by adding: ". . . for disposal, or an economic method of separating valuable isotopes from the waste."

The possibility that the high-level waste may become of value at some future time as a source of rare isotopes is discussed in Section V-F, "Secondary (Indirect) Environmental Effects of Alternatives." For clarity, footnote a of Table I-2 and footnote b of Table XIII-2 have been revised.

Groundwater

O-2 The analyses of groundwater movement should consider existing vertical hydraulic gradients, as described on pages 19 through 21 of the NAS report 1/and should assess impacts of changes in vertical gradients that are expected as results of stresses induced by the proposed bedrock storage of radwastes, as indicated on pages 23 through 31 of the NAS report.

The vertical gradients in the crystalline metamorphic rock used in the NAS Report assume that the difference in head between the Coastal Plain sediments and that in the metamorphic rock is distributed across the upper 500 feet of crystalline rock. There is some evidence that there is no vertical gradient in the upper 1000 feet of metamorphic rock, but that the entire gradient between the rock and the Tuscaloosa occurs across the saprolite. This evidence comes from long-term water level measurement of an upper zone and a lower zone in one bedrock well. The gradient in the upper 500 feet of metamorphic rock was used in the NAS analysis as a worst-case assumption. The details of previous hydrologic analyses are not presented because the bedrock storage option is not being recommended for R&D funding.

1/ National Academy of Sciences, 1972, An evaluation of the concept of storing radioactive wastes in bedrock below the Savannah River Plant Site, Report by the Committee on Radioactive Waste Management, National Academy of Sciences, National Research Council.

O-3 The engineered corrective action to reduce aquifer exposure in the event of release of radionuclides would involve drilling test wells to determine the boundaries of acceptable dilution. The final statement should indicate whether the probable three-dimensional distribution of any accidental releases to the aquifer has been analyzed on the basis of the physical, chemical, and hydraulic characteristics of the aquifer and aquicludes--a logical first step in planning a successful drilling program to delineate the distribution of escaped contaminants. It is not clear whether induced hydraulic gradients resulting from onsite groundwater withdrawals of wells in the Tuscaloosa aquifer have been considered in the analysis of the movement of contaminants. Furthermore, because of the long time periods involved and the probable increased use of the Tuscaloosa aquifer as the population grows, it would seem appropriate to assess the potential for any significant changes in direction and magnitude of hydraulic gradient toward "worst-case" hypothetical heavy pumping at the reservation boundary. The final statement should indicate whether interception and withdrawal of contaminated groundwater has been considered as a possible mitigating measure.

In this generic treatment the population doses from contamination of the Tuscaloosa aquifer given in Sections V, XII, and XIII are believed to be upper-bound estimates based on pessimistic assumptions described in the backup document (ERDA 77-42, Section V). Assumptions leading to contamination of the acquifer include an earthquake either cracking the bedrock or causing failure of the access shaft permitting contact of the wastes with the acquifer. Fifty thousand users begin drinking the water 100 years after the contamination. Analyses of the environmental impacts of the alternatives take no credit for potential corrective actions. Corrective actions considered include 1) drilling test wells to determine the extent of contamination and 2) repair of access shaft to re-isolate the wastes. Interception and withdrawal of contaminated ground water has not been considered as a possible mitigating measure. Should this method be proposed for final disposal of the SRP wastes, detailed analyses such as those suggested would be included in a project-specific environmental review.

Biota

O-4 This section contains no supportive data for the statement, "Radiation releases . . . have had no significant effect on the wildlife." If scientific studies have been conducted and statistical analyses performed which substantiate this conclusion, summaries of these data should be included and all work referenced. If no such data are available, the statement would be eliminated or corrected to indicate that it is subjective judgment.

This section should also include a more detailed discussion of the onsite biota at the site, as this information is essential to a determination of the project's impacts on fish and wildlife resources. Available data on endangered and threatened species should be presented.

The text was changed to state that ongoing monitoring shows that the SRP contribution to the $^{137}Cs$ content of fish and deer is minor. Summaries of studies conducted at SRP are included in the referenced document ERDA-1537, p. II-178 to II-184.

Detailed discussion of biota on the SRP plantsite is given in the referenced documents (ERDA Reports DP-1323 and ERDA-1537). Field surveys will be conducted to identify the biota affected by proposed projects. Survey results and potential impacts on endangered or threatened species will be discussed in project-specific EIS's.

Alternative 3

O-5 Plans include allowing storage space for radiolytic gas above the wastes in the bedrock caverns as noted on page IV-19. However, the statement should assess the impacts of the potential gas drive, which the NAS report calculated to be equivalent to that of 1,500 feet of water after 25 to 30 years. (Calculations of the gas drive, according to the NAS report, were based on allowing 20 million cubic feet for storage of gas and inleakage instead of the 17 million cubic feet suggested on page IV-19 of the draft statement.) The possibility of mitigation measures such as gas absorption or venting should be evaluated.

For the purpose of this EIS, conservative generic impact studies are presented to estimate the upper bound impacts which could result from credible occurrences. Any impacts resulting from failure of the bedrock cavern due to radiolytic gas pressure drive are expected to be of much lower magnitude than those resulting from the presumed earthquake scenario and, therefore, would not significantly affect the results of this EIS.

O-5 contd The explosion hazard for gases generated by decomposition of water and other constituents of the wastes should be addressed--at least by reference. (See NAS report, pages 38, 45, 46.)

Impact on Plant and Animal Communities

O-6 The first paragraph of this section on page V-2 states that "no change would be expected in the welfare of any endangered species on the site." Since the draft statement does not identify the endangered species that might be impacted, this judgment appears to be premature. We believe that the presence or absence of any endangered or threatened species in the area should first be documented; the final statement should describe the methodology used. If any such species do occur within range of the proposed action, potential impacts should be identified and a Section 7 consultation should be initiated.

The detailed discussion of biota in ERDA-1537 is incorporated by reference. Endangered species identified on the site include the bald eagle, redcockraded woodpecker, Kirtland's warbler, and alligators. No effect on these species is expected from the conduct of the proposed R&D program.

As stated in response to Comment No. O-4, field surveys will be conducted in support of project-specific proposals and will determine if endangered species are within the range of the proposed action. If so, potential impacts will be identified and a Section 7 consultation will be initiated in the project-specific environmental review.

Potential Effects from Normal Operations for Each Alternative

O-7 The final statement should address the potential effects of long-term, low-level radiation exposure on humans and on plants and animals. Although only limited data is available on chronic dose-effect relationships, an effort should be made to discuss this topic as fully as possible.

The biological effects on human populations of low levels of ionizing radiation are discussed in Response M-1. Because of the uncertainties involved in deriving dose-health factors, absolute values calculated from such factors are of questionable value. Since health effects from man-made radiation do not differ in kind, probability, or severity from the effects from natural radiation, we have chosen to evaluate radiological impact from the alternatives in this EIS by comparison with natural radiation exposure. For all alternatives considered, the population doses are a very small fraction of the natural dose to the population. Furthermore, these population doses from alternatives are within the range of variation of natural radiation exposure.

The radiation doses to biota other than humans are due primarily to direct irradiation from transportation of radioactive materials and atmospheric release of radioactive materials during facility operation; these doses are similar in magnitude for all biota. The BEIR Report concludes that no other living organisms are much more radiosensitive than human beings. The health effects in a given population of other life forms are thus similar in magnitude or smaller than for human beings. Because the analyses have shown there are no substantial radiation-related environmental impacts in the human population, there should be significant impact on other life forms.

Comparison of Risks with Natural Background and Standards

O-8 We note "As detailed in other sections of this report, estimated exposures to the general population for the various alternative plans for long-term waste management are far below exposures from naturally occurring radioisotopes . . . ." This fact is emphasized throughout the statement; however, equal emphasis is not given to the fact that this radiation is in addition to radiation exposure from naturally existing radioisotopes. As mentioned in the preceding paragraph, only limited data exist on the effects of long-term exposures of plant and animal populations and human populations to low-level radiation. The final statement should indicate that little is known about the potential long-term impacts of continuing to increase the radiation levels to which individuals, as well as fish and wildlife, are daily exposed. We believe this is especially important, as the draft statement contends that successful demonstration of long-term management of high-level radioactive wastes could have an important socio-political bearing on the public acceptability of nuclear power generation and thus result in greater utilization of nuclear power.

All radiation doses for the alternatives considered in the EIS are incremental, or in addition to natural radiation exposure. However, as discussed in Response O-7, these doses are very small fractions of natural radiation exposure and are within the range of variation of natural exposure.

Also, see Responses M-3 and O-7 for discussion of radiation health effects.

Reduction of River Water Exposure

O-9 The corrective action proposed to reduce river water exposure from radionuclides entering the Savannah River as a result of the tank farm's abandonment, or sabotage, or being struck by an airplane assumes that contamination pulses on the river would last "at most a day or two." As was pointed out previously in our comments on the ERDA draft statement, the migration of radionuclides from the tanks to the river would be a complex long-drawn-out process that would be likely to affect the river for much longer periods. There is no evidence that a detailed analysis has been made of the range of consequences due to abandonment, sabotage, or an airplane crash. We believe the estimates of corrective action ranging from $2 to 5 million (table XII-11, p. XII-18) are unrealistically low.

In this generic EIS and its backup reference (ERDA 77-42), assumptions believed to be pessimistic were used to provide worst-case estimates of sabotage, airplane crash, abandonment, etc. No credit was taken for corrective actions in the impact analyses after abandonment. The corrective actions are only provided to indicate that some readily available, reasonably inexpensive actions exist which could result in significant impact reduction.

Minor Comment

O-10 A date is needed for the measurements on which the contours are based in figure III-5, Flow in Tuscaloosa Aquifer.

The date for the measurements on which the contours in Figure III-5 are based is about 1958. However, long-term hydrographs for selected wells dating back to 1952 show that there has been no progressive decrease or increase in water levels in the Tuscaloosa aquifer. Thus, the map is applicable to the present hydrologic regimen in the Tuscaloosa.

We hope these comments will be helpful to you in the preparation of a final statement.

Sincerely,

Larry E. Meierotte
SECRETARY

OFFICE OF THE GOVERNOR
Atlanta, Georgia 30334
George Busbee
GOVERNOR
Norman Underwood
EXECUTIVE SECRETARY
*January 8, 1979*

Mr. W. H. Pennington, Director
Division of Program Review and Coordination
Office of NEPA Affairs
Department of Energy
Washington, D. C. 20545

Dear Mr. Pennington:

P-1 In August, 1978 the Georgia State Clearinghouse received a copy of DOE/EIS-0023-D, entitled "Draft Environmental Impact Statement - Long Term Management of Defense High-Level Radioactive Wastes at Savannah River Plant." As you know, in my letter of August 10, 1977 to you, I transmitted extensive detailed comments provided by our technical staff on a preliminary report, ERDA 77-42/1 and 2, on the same subject as the recent Draft EIS (see attached).

Even though you initially expressed a desire to have comments from Georgia by November of 1978, we have waited until now to complete our review of the Draft EIS because we also wanted to compare the policy aspects with the recent document, "Report to the President by the Interagency Review Group on Nuclear Waste Management." Our technical staff has now completed its review and prepared the attached comments.

The efforts by the DOE at the Savannah River Plant are inconsistent with the IRG Report to the President in that they represent a uni-lateral approach to the continued advancement of a bedrock storage concept for SRP high level wastes. Also, DOE has proceeded to spend the taxpayers' money to *foster the bedrock storage concept in spite of strong opposition* by the State of Georgia, the U. S. Environmental Protection Agency, and the National Academy of Sciences. As I indicated in my letter to the former Administrator of ERDA, Dr. Seamons and again, in my August 10, 1977 letter to you, Georgia is unalterably opposed to any repository that could conceivably result in the radioactive contamination of Georgia's underground water resources. *It is quite apparent* that DOE is proceeding to further develop a bedrock storage facility at the Savannah River Plant with a complete disregard of Georgia's position and concern in the matter. You are advised that I am requesting the Georgia Attorney General to become thoroughly briefed on DOE's efforts in the event that Georgia has to exercise all available options to protect the health and safety of the citizens of our State.

All work on the bedrock storage concept was indefinitely postponed in November 1972. The alternative of an R&D program on disposing of the SRP *wastes in bedrock was included* in this EIS as an alternative required to be analyzed under NEPA to the preferred alternative which is to proceed with an R&D program to provide the required information for immobilization of the Savannah River Plant wastes, consistent with the recommendations of the IRG.

P-1 contd I would appreciate your timely and substantive response to Georgia's position in this highly important matter.

Sincerely,

George Busbee
GB/jsm

Review of DOE/EIS - 0023 - D, "Draft Environmental Impact Statement; Long-Term Management of Defense High Level Wastes; Savannah River Plant - Aiken, South Carolina"
by
State of Georgia

P-2 (1) In May, 1977 a document was issued by DOE (ERDA), ERDA 77-42/1&2, which presented preliminary information about several different alternatives for management of high level wastes at SRP. The purpose of that document was generalized and vague. The purpose for the recent draft EIS is even more confusing. It appears that DOE has developed the draft EIS around three of the original twenty-three alternatives without attempting to explain the process for decision making. The key question is what action is going to be taken that requires this draft EIS.

The purpose of this document is to explore the environmental implications of a large research and development program aimed at providing the information required to replace interim tank storage of the wastes with immobilization for long-term management. The Foreword and Summary have been modified to respond to this comment. The three alternatives in this EIS include the full range of potential environmental impacts which could result from any of the 23 alternatives in ERDA 77-42.

P-3 (2) The summary sheet for the draft EIS states: "There are no substantial environmental impacts associated with nuclear radiation for any of the three alternatives." This statement is not only incorrect, it represents a complete disregard of Georgia and EPA's position of opposition to bedrock storage at SRP because of the potential contamination of the Tuscaloosa Aquifer. It certainly reflects DOE's lack of technical credibility as well as its lack of political sensitivity in this particular instance.

The basis for the statement that there are no substantial environmental impacts arising from nuclear radiation for any of the three alternatives is discussed in Section XIII, "Environmental Trade-Offs Among Alternatives," and is related to a comparison of the offsite risks from the alternatives with risks from natural background radiation to the surrounding population.

Appendix A points out that there is significant opposition to bedrock disposal of radioactive wastes under the SRP site, and all work on the bedrock disposal concept was stopped in 1972, partly as a result of political considerations by the U.S. Atomic Energy Commission.

P-4 (3) On page I-1 of the summary statement, DOE states that *the high-level nuclear wastes has been and is continuing* to be stored safely in underground tanks that are engineered to provide reliable storage of the waste isolated from the environment. This statement is inconsistent with the information contained in ERDA-1537 entitled, "Waste Management Operations; Savannah River Plant, Aiken, South Carolina." On page III-85 of ERDA-1537, an area of soil around Tank No. 8 is described as having been contaminated by an overflow of acid wastes containing Cesium-137. Soil depths of one to fourteen feet were contaminated with an estimated 5,000 curies of cesium-137 radioactivity. Additional information is presented which describes several other failures which resulted in leaks of various radionuclides to the environment.

The Savannah River Plant is well along into an interim waste management program of retiring older tanks and transferring the waste to new, double-walled, stress-relieved tanks that are not expected to leak. The small leaks and spills that have occurred in the past are contained in the soil near the tanks, and pose no threat to the rest of the environment.

P-4A (4) The draft EIS states that "disposal" means that waste is retrievable with only moderate effort. One of the three alternatives considered in the report is direct injection of the high level waste slurry into a bedrock cavern. It is inconceivable that disposal by this alternative could mean that retrievable could take place with only moderate effort. Since the waste slurry would be highly acid in character as well as radioactive, the damage done to the receiving rock strata might prohibit removal on an economically feasible basis.

In both Section I, Summary, and Appendix C, Glossary, it is explicitly stated that a disposal concept includes no expectation of retrievability. However, we expect the NRC to require retrievability for up to 50 years and the difficulty of retrieving the waste slurry from the bedrock would be a significant disadvantage to its use.

P-5 (5) On page III-9 of the draft EIS, a discussion of the flow of ground water in the Tuscaloosa aquifer is presented. DOE states that on the basis of piezometric measurements, the Tuscaloosa water flows from the Aiken Plateau in a curved path to the Savannah River valley. This same information was also presented in a more detailed manner at a meeting on May 3, 1977 between Georgia representatives and Mr. Wendell Marine of DuPont's Savannah River Laboratory. At that meeting, the Georgia State Geologist expressed reservations about interpretation of the piezometric data. For example, the Georgia State Geologist indicated that his information indicated that there was leakage and crossover from the Tuscaloosa aquifer into other formations where groundwater patterns were in a circulatory south by southeast direction. The current draft EIS doesn't even discuss this possibility. Because of the concern expressed by Georgia, EPA, and the National Academy of Sciences in regard to the potential contamination of the groundwater, it would appear that DOE should have devoted considerably more detail to this important subject.

Within the vicinity of SRP, no aquifer above the Tuscaloosa has a head lower than Savannah River level, thus water moves preferentially toward the Savannah River. Even though there is a small upward gradient from the Ellenton formation to the Congaree as shown in Figure III-4, these formations are separated by a clay that appears to be continuous over a large region and prevents gross transfer of water. To the southeast in the vicinity of Savannah, Georgia, a large cone of depression exists in the Principal Artesian Aquifer which overlies the Tuscaloosa. This probably creates a much larger head differential between the two aquifers and upward leakage might occur. However, the water in the Tuscaloosa formation beneath Savannah has not passed beneath SRP as shown in Figure III-5.



P-6 (6) The section of the draft EIS related to seismicity is completely inadequate. As it is written, it tends to leave the impression that there is no activity in the area and that there is nothing about which to be concerned. In addition to the Charleston, S.C. earthquake in 1886 which registered an intensity of X on the Modified Mercalli Scale, several other seismic activities have occurred in the area. The Earthquake Data Service of the National Oceanic and Atmospheric Administration publishes updated lists of such occurrences throughout the United States. The following is a partial list of earthquakes recorded in the vicinity of the Georgia-South Carolina border.

| Year | Date | N. Lat. | W. Long. | Intensity |
|---|---|---|---|---|
| 1903 | Jan. 23 | 32.1 | 81.1 | VI |
| 1912 | June 20 | 32.0 | 81.0 | V |
| 1971 | May 19 | 33.3 | 80.6 | V |
| 1971 | July 13 | -- | -- | VI |
| 1972 | Feb. 3 | 35.0 | 80.4 | V |
| 1974 | Aug. 2 | 33.9 | 82.5 | V |
| 1974 | Nov. 5 | 33.7 | 82.2 | III |
| 1974 | Nov. 11 | 32.9 | 80.1 | VI |

Detailed site seismic data is included in ERDA-1537 and is incorporated in this EIS by reference. ERDA-1537 includes a description of the Charleston earthquake and its relationship to the SRP site as well as other historic data on seismicity.

P-7 (7) It is interesting to note that in ERDA 77-42/1 & 2, such items as "modern tanks" are used to describe the storage containers for the high level acid wastes. This same vagueness occurs in the recent draft EIS. DOE uses the term, "type III tank," without describing it. This is a controversial question and requires elaboration by DOE. At SRP and Hanford where carbon steel tanks have been used in lieu of stainless steel, stress cracks, deterioration, leaks, and other problems have developed. It is difficult to understand why DOE keeps failing to describe what kind of tank that will be used should Alternative No. 1 be chosen for high level waste management.

The use of the underground double-shell high-level waste storage tanks was considered in the following environmental documents:

1. "Final Environmental Statement - Waste Management Operations, Savannah River Plant," ERDA-1537, September 1977.
2. "Environmental Statement - Additional High-Level Waste Facilities, Savannah River Plant," WASH-1580, August 1974.
3. "Environmental Statement - Future High-Level Waste Facilities, Savannah River Plant," WASH-1528, April 1975.

Recently, DOE was directed by the United States Court of Appeals for the District of Columbia (NRDC vs. Administrator, ERDA/DOE) to prepare a supplement to ERDA-1537 to address certain specific design and safety features of these high-level waste storage tanks. This supplemental EIS is in preparation and will be issued for public review and comment. The Type III tank is described in detail in ERDA-1537, p. II-90 to II-96. This is a subsurface, 1.3 million gallon carbon steel tank with a full height carbon steel secondary liner all enclosed within at least 2.5 feet of concrete. The primary tank is fully stress relieved to inhibit stress corrosion cracking.

P-8 (8) The discussion of "risk" is inadequate and very misleading throughout the entire draft EIS. In some cases the calculated risks are based on only limited and narrow assumptions without consideration of the total picture. This is particularly true for Alternative No. 3 because the groundwater movement, population served, and other factors assumed by DOE are incorrect.

Some aspects of the risk assessment depend upon bounding, or upper limit assumptions, because some systems are not presently designed in enough detail to allow more formal risk methodology to be applied. Such assumptions are necessary only for some of the abnormal events, and are discussed in Section V-C, Potential Effects from Abnormal Events for Each Alternative.

P-9 (9) Many important issues raised during Georgia's review of the earlier report, ERDA 77-42/1 & 2, were not even considered in the preparation of the draft EIS because it is devoid of any reference to the problem. Those issues still continue to be valid and are hereby included as part of the review of the draft EIS. In addition, because of the relationship of the earlier report on Waste Management Operations (ERDA-1537), Georgia's comments on this document are also attached as part of its review of the draft EIS (DOE/EIS-0023-D).

It is the technical judgment of the preparers of this document and its references that the factors used in risk analysis of Alternative 3 are either measured and correct, or are reasonable upper-limit assumptions.

DOE has used its best efforts to ensure that all substantive comments on ERDA 77-42 were taken into account in preparing this Programmatic EIS. The Governor of Georgia's comments, and responses by DOE, are included in this appendix also. The comments on ERDA-1537 were considered in the past, when that document was prepared in final form.

Review of ERDA 77-42/1&2, "Alternatives for Long-Term Management of Defense High-Level Radioactive Waste".
by
State of Georgia

P-10 1. In the "Foreword", the document states that the purpose of the report is "to provide other Government agencies and the public with information"--- and "to serve as a basis for discussion and judgement in future decision making". It also states "the document presents factual information---". After reviewing the report in some detail, it is fairly easy to conclude that these objectives were not met. It looks as though the person who established the objectives and the people that did the preparation of the report didn't communicate with each other. The information presented in the report is based on a large number of assumptions that are not qualified, or verified, and might easily lead management people in Government to make costly decisions without having a well defined basis.

The objective of the DOE high-level waste management program is to isolate the waste from the environment for long enough or in secure enough manner that it will pose negligible risk to human welfare. The purposes of ERDA 77-42 are to describe the different alternatives along with their probable relative costs, risks, and uncertainties; and to raise the issue of methodology for decision-making in nuclear waste management. This EIS further forms the issues for developing the research and development program to manage radioactive high-level waste. Final decision on the immobilization process and the waste form will be supported by subsequent environmental documentation. Specific comments on assumptions have been addressed within.

P-11 2. The Foreword also states that the document "does not take into account social and public policy issues". This appears to be an attempt to get around having to enumerate certain concerns that might influence decision makers. The definition of a social or public policy issue must be different than the context in which they are currently defined in governmental circles today. If the contamination of a groundwater source that serves all of Southeast Georgia is not a public issue they must be using a pretty unconvential definition of the term. Also, if transportation is not a public issue then I don't know what would be classified as such. It is tempting to speculate that the authors of the report do discuss a social issue when it supports their objective, whatever that might be. As an example, on page II-15 of the report it states --- "some social implications --- are discussed below".

Future funding of bedrock storage is not recommended in DOE/EIS-0023 and the method was included in ERDA 77-42/1&2 for the required completeness of the analysis. "Social and public policy issues" are addressed to the extent that they relate to environmental impacts and will be addressed further in any future documentation in support of a specific facility for the management of high-level waste at Savannah River.

P-12 3. In many sections of the report such terms as "modern tanks", "reliable isolation of waste", "modern design", and "old waste tanks of the best type available" are used. Its almost as though the definitions of such terms are carefully avoided so that the decision makers" minds are not clouded with certain information. As an example, a controversial issue has arisen at SRP and Hanford regarding the type of tank and tank design used to presently store high level waste. The carbon steel tanks have been used in lieu of stainless steel tanks and as a result stress cracks, deteriation, leaks, and other problems have developed. How is the term "modern" to be interpreted? Does this mean the continued use of carbon steel or does it mean the use of stainless?

As used in the subject document and similar documents concerning SRP programs, the terms "modern tanks" and "modern design" refer to the class of waste tanks constructed since 1966 and/or currently under construction. These tanks, locally designated "Type III," differ from earlier SRP tanks primarily in that the primary vessel (inner steel tank) of the Type III design is fully stress-relieved by in-situ heat treatment after fabrication. This heat treatment relieves the high internal stresses "locked into" the steel in the process of seam welding together the many separate plates from which the tank is fabricated; elimination of these "locked in" stresses (locally often much higher than stresses induced by hydraulic loading of the vessel) eliminates a primary requisite for stress corrosion cracking and thereby is a major advancement in maintaining the integrity of the tanks. The Type III tanks also incorporate several other improvements over the tanks of earlier design, including full-height secondary tanks, air cooling under the bottom of the primary tank, bottom-supported cooling coils (in all but two of the earlier Type III tanks), improved and tighter steel specifications, provisions for detection of leaks through the secondary vessel (except in the first seven Type III tanks), and numerous improvements of smaller scope. The Type III tank is described in detail on pages II-90 to II-96 of ERDA-1537. There are no plans to make SRP waste tanks of stainless steel for reasons discussed under Comment 22.



P-13 4. On page II-5 of the report, the authors use a very narrow approach based on a limited viewpoint to lead a reader to believe that the release of radioactivity to the environment would not be too dangerous. I specifically refer to the following paragraph:

"Liquid releases from SRP would be absorbed in the soil or diluted many orders of magnitude by the onsite creeks and swamps and by the Savannah River before reaching drinking water users. Even if diversion systems fail and no corrective actions are taken, no large individual doses can occur."

They are actually referring to the high level waste stored in the carbon steel tanks at SRP and the statement leaves the distinct impression that the surrounding natural resources can be used as a back up control because the plutonium, strontium, ceasium, and other radioactive isotopes would be diluted in concentration. Evidently the authors are still firmly committed to the old phrase, "the solution to pollution is dillution". This approach really destroys the professional credibility of the authors.

It is not the intent of DOE to imply that dilution is an acceptable method of handling the disposal of radioactive wastes. DOE is firmly committed to a multiple barrier approach to long-term waste management. These barriers involve (1) Administrative control (2) engineered safety systems (3) passive physical containment of waste (4) integrity of the waste form itself and (5) location of the waste relative to parts of the environment used by man. The purpose of the referenced statement is to show that even in the unlikely event that the first four barriers would fail, the fifth barrier (dilution) would ensure that no significant harm would come to the offsite water users.

P-14 On page II-9, the report states that all the geologic disposal options would require construction and observation of large-scale exploratory shafts for a time period long enough to give a high level of confidence of their continued integrity after sealing. It fails to mention that criteria for making these judgments are not available and there is no current definition for "high level of confidence". Again, this approach misleads a decision maker who is not as technically well-grounded in the subject.

This statement is emphasizing that confidence in geologic systems cannot be obtained from wells alone, a point emphasized by the NAS Report. It is not intended to be exhaustive in the tests or criteria that would be applied to an in situ test facility.

P-15 6. On page II-14, Table II-3 lists the incremental cost/risk for plan No. 22 as a base for all other plans. There is no explanation of the term "base" yet all the rest of the factors for Table II-3 relate to it.

Incremental cost/risk analysis is used in the Programmatic EIS in Table XII-5 through XII-9, and the explanation of the basis is given in Section XII-A.3.

P-16 7. The subject of transportation is improperly handled in the report. The statements do not reflect a current understanding of this complex national issue. They do not reference current NRC publications such as NUREG-0170, NUREG-0073, or NUREG-0015. Also the authors do not give any indications of any awareness of the national controversy associated with transportation through large urban areas. On page II-6 they say the risk from transportation is very low while on page III-1 they say that the disadvantage of shipping offsite to a Federal Repository is the risk and cost incurred during transportation.

The approach taken in this Programmatic EIS and its backup reference, ERDA 77-42, toward transportation risks was to assume a generic transportation environment and bounding physical assumptions to arrive at the conclusion that radiation related transportation risks are small. The statement that transportation risk is a disadvantage to shipping waste offsite is not inconsistent with the finding that transportation risk is small - particularly in view of the finding that risks from all aspects of the alternatives presented are small.

DOE is aware of the studies, recently completed and in progress, covering radioactive materials transportation, and the results of these studies and any regulations following from them will be taken into account in any project-specific EIS involving transportation off the SRP site. However, the research and development, design, and testing program covered under this Programmatic EIS is not sensitive to details of future offsite transportation scenarios. Therefore, DOE maintains that the subject of transportation is handled properly for purposes of this document.



P-17 8. Throughout the whole report risks are calculated and left as pure numbers without any qualifying statements that justify their authenticity. As an example, risk factors are given for many different aspects of bedrock storage at SRP as it relates to the Tuscaloosa aquifer. Yet on page III-3, the following statement is made:

"Because the consequences of the wastes migrating into the aquifer are potentially very high, it would be necessary to establish with great certainty that there are no mechanisms which would allow the waste to migrate before sufficient decay". In other words, they admit that they don't know what to expect with any degree of certainty within the aquifer but they go ahead and calculate risk factors, assign costs to them and conclude that slurrying the wastes into a bedrock facility at SRP is the lowest cost alternative.

Many of the risks covered are known to a high degree of certainty from experience with operations of similar facilities. Other risks, particularly from sabotage, are known with less certainty. The basic data involved in the structure of the risks are available in the EIS and its references, so that the reader may use his own assessment of unlikely probabilities, etc., to arrive at risks if he so desires.

The bases of the risk assessments for unusual events and for normal operations are discussed in Sections V-B and V-C, and a discussion of the sensitivity of the results is given in Section XII-C.

P-18 9. Table III-2 on page III-4 lists the molar concentrations of the non-radioactive components of the SRP high level wastes. It is interesting to note that the waste is 3.3 molar in sodium nitrate ($NaNO_3$). The contamination of the Tuscalloosa aquifer with millions of gallons of nitrate bearing wastes of this concentration is in direct conflict with efforts to reduce nitrates in wastewater effluents and from other sources.

DOE does not intend to take any action that has significant probability of releasing nitrate to any body of water in harmful amounts.

P-19 10. The key to all the alternatives except for continuation of storage in liquid form is the application of technology to resuspend existing salt cakes and/or transfer the wastes for chemical precipitation and solidification. There is very little mention of the fact that there are serious doubts about the application or existence of such tehcnology at the present time. On page III-16 there is a very weak statement to this effect:

"Sludge removal and tank cleanout have been demonstrated but improved technology is currently being developed."

Current operations at Savannah River are demonstrating the technology in question and results are included regularly in monthly reports. The success in tank cleanout has been the result of improved technology that is continuing to be developed.

P-20 11. It is interesting to note the differentation in canning. If lower level wastes are to be stored at SRP in an onsite storage facility they plan to double can it. However, if high level waste is going to be put into a bedrock cavern (where it has a big potential for contaminating the groundwater) they plan to only single can it. If they store high level waste on the surface they not only are going to double can it but one will be stainless steel. (page III-25)

The process for waste containerization covered in this Programmatic EIS includes a single stainless steel canister. Later plans may feature additional canning of the waste, depending upon details of the storage or disposal environments. The research and development, design, and testing program covered under this document is not sensitive to later decisions regarding additional canisters.

P-21 12. In Alternate Plan 22 on page III-28, it is mentioned that before the bedrock storage cavern concept can be implemented, there will have to be, drilling and exvacation of an exploratory shaft and tunnels. There is no mention of the fact that there are two existing such tunnels already in existence at SRP (statement made by Mr. Wendel Marine of DuPont Savannah River Laboratory to DNR Representatives on May 3, 1977).

There are no shafts or tunnels in existence at SRP. Mr. Marine denies making such a statement.

P-22 13. Alternate Plan 23 assumes continued storage of wastes as sludge and damp salt cake in double walled underground tanks similar to those commonly in use at SRP. There is no mention of problems with these tanks even though they indicate more than twenty years experience. Why are stainless stell tanks not considered as an alternative? The present tanks are carbon steel and along with those ar Hanford, have become a national controversial issue.

The use of stainless steel rather than mild (carbon) steel for SRP waste tanks has been considered in depth several times by Savannah River Plant technical groups. Included in the evaluations were safety, technical, and economic considerations. Austenitic stainless steels are susceptible under specific conditions to the same forms of corrosion that can damage carbon steels, including stress corrosion cracking promoted by chlorides, caustic, and/or fluorides. Pitting and/or intergranular corrosion can occur due to chlorides, fluorides, nitrates, chromates, and other ionic species, especially in heat-affected zones near welds. The susceptibility of stainless steel pipes and vessels to rapid and complete penetration due to trace quantities of chloride is widely known. These shortcomings do not render stainless steel unfit for radioactive waste storage; but, as with mild steel, they do require that the specific chemical nature of waste being stored and changes that may occur during storage must be known, and must be amenable to control and adjustment so that conditions corrosive to the steels are avoided. SRP waste properties relevant to storage in mild steel tanks have been well characterized by 25 years' operating experience and laboratory studies, which provide a high level of confi-

P-22 contd dence in the longevity of the stress-relieved carbon steel tanks of current design. A similar level of confidence in storing SRP wastes in stainless steel tanks could be obtained only after extensive tests and changes to the separations processes.

In general, stainless steel waste tanks are used or proposed for storage of radioactive wastes in the acidic state, rather than the alkaline state used at SRP. The primary advantages of acidic waste storage are (a) less waste volume per unit of reactor fuel processed, and (b) substantially less insoluble material (sludge) in the stored waste. The former advantage applies primarily to waste from nonalloyed fuels; where fuels of highly enriched uranium alloyed with aluminum are used, as in the SRP HM process, or where aluminum is added as a processing reagent, the quantity of nonvolatile solids in acidic waste from a given amount of fuel is not substantially lower than it would be in alkaline waste. The lower sludge content of acidic waste is a significant advantage in wastes from high-burnout fuels from power reactors (military or commercial), because removal of fission product heat liberated directly into the liquid phase (by fission products in solution) is much more efficient than removal of the same amount of heat from the sludge that would be present if the waste were alkaline. This mandates the use of acid storage (and stainless steel tanks) for power reactor high-heat wastes, but not for SRP reactor wastes at current operating rates and parameters, where the maximum fission product heat yield can be readily removed from the sludge layer characteristic of alkaline wastes.

Now that the stress corrosion cracking problem has been overcome by stress-relieving the newer (and all future) waste tanks and by close attention to steel quality and waste composition (especially the ratio of inhibiting $OH^-$ and $NO_2^-$ ions to aggressive $NO_3^-$ ions), mild steel is considered to be just as safe and effective for storage of SRP wastes as stainless steel would be. In addition, storage of wastes in alkaline form offers some inherent safety advantages for SRP: (a) the inclusion of the majority of the radionuclides in an insoluble and relatively immobile sludge phase, (b) the relatively low mobility of alkaline waste in SRP soil due to soil pluggage by hydroxide ion, and (c) the greater retention under alkaline conditions of radionuclides by ion exchange with the soil.

Complete conversion of SRP waste management practices to the storage of radioactive wastes in acid form is not feasible because of the large amount of alkaline waste already on hand and because some SRP wastes are inherently alkaline, e.g., the cladding removal waste from the Purex process (for nonalloyed uranium fuel). Concurrent operation of separate facilities for acid and alkaline waste storage would not be economical. Also, the only nonvolatile solids in current alkaline wastes, that would not be present in acid wastes, are the various sodium salts (nitrate, nitrite, carbonate, sulfate, and hydroxide). In the reference process, these

P-22 contd sodium salts will be separated from the fission products and other compounds in the waste when the latter two salts are vitrified and packaged for final disposal. Hence, the salts will not contribute to the bulk of the vitrified wastes to be disposed of.

P-23 14. On page V-12, the statement is made that about 10,000 nuclear weapons have been stored for at least ten years without a sabotage incident. Does this mean that there have been no attempts or that none have been successful:

The analysis implies that no sabotage attempts have been successful.

P-24 15. On page V-18, leach rate experiments are described and the time to release 1% of the Cs-137, Sr-90, and gross alpha radioactivity is calculated. Yet, the experiments were conducted on cylinders only one half inch in diameter by one half inch high. One can only speculate as to the magnitude of scale up errors involved in going to full scale.

Leach results from the small samples were used for conservatism and to approximate conditions of cracking of larger monoliths. Scaleup from small sizes to larger sizes, with lower surface-to-volume ratio, would result in lower releases from leaching.

P-25 16. On page V-41 it is assumed that there is a potential 50,000 users of Tuscaloosa aquifer drinking water. Another ERDA report (DP-1438) describes a technical assessment of Bedrock Waste Storage at SRP and it is from this reference that the number of 50,000 is obtained. It is interesting to note that any information from DP-1438 was carefully excluded from ERDA-1537 an environmental statement about waste management operations at SRP. They have so confused the whole subject of waste management through a piecemeal approach, one can only speculate as to the credibility of the information used and the conclusions drawn from it.

Present waste management operation only are covered in ERDA 1537. Since present operations do not involve the Tuscaloosa aquifer, there was no utility in discussing bedrock disposal and its risk to the aquifer in that document. This Programmatic EIS, and its references, are concerned with long-term options for future disposal of the waste and therefore are the proper place to discuss bedrock disposal.

P-26 17. On Page V-42, a very important point is raised in regard to the possibility of an explosion. Radiolysis will cause hydrogen and oxygen to form in a bedrock cavern thus creating a potentially explosive atmosphere. Should an explosion occur inside the cavern, the consequences are really unknown. It will place stress on the cavern and the aquifer and increase the chances of water movement thus increasing the potential for additional contamination of the aquifer. The authors dismiss this event as being without consequence.

As stated in the text of ERDA 77-42, the hydrogen explosion possibility has been analyzed in the bedrock reference (DP-1438) and the consequences from such an explosion were found to be insignificant. DOE has seen no scientific evidence presented to invalidate that conclusion.

P-27 18. On page V-43 of the report, the consequence of an earthquake in relation to a bedrock cavern at SRP and the Tuscaloose aquifer are discussed. The authors assume that the water flow rate is through the aquifer to the Savannah River and that the flow rate is quite low. Thus they postulate that any rupture of wastes into the aquifer would be confined to plantsite for several thousand years and that only the 50,000 people that move onto the plantsite and use the water have to be taken into consideration. Hydrogically and geologically speaking, these are improper assumptions. The water from the Tuscaloosa aquifer feeds into the principal artesian aquifer which serves all of Southeast Georgia.

The geologic term "Tuscaloosa" is used from North Carolina to Louisiana to designate an Upper Cretaceous sand with clay layers and lenses. The hydrologic regimes within this formation are much more local in extent. Thus, even though the Tuscaloosa is a large and prolific aquifer in Georgia, none of this water comes from South Carolina due to discharge at the Savannah River. The "Principal Artesian Aquifer" of Georgia is equivalent to the Ocala limestone of Eocene age, and its principal cone of depression is at Savannah, 100 miles away from SRP. Water in the relatively local Tuscaloosa circulation system in the SRP vicinity does not contribute to the Principal Artesian Aquifer at Savannah.

P-27 contd The consequences of contaminating this invaluable water supply would be technically, socially, and politically disasterous for the people of Georgia. Any acceptance of the possibility of contamination of this water supply by radioactive nuclides such as those of plutonium, strontium, and cesium would be irresponsible.

P-28 19. On page V-44 and V-45, the assumption is made that plutonium would be bound in the rock of a cavern and thus not move into the surrounding groundwater. There is really no good basis for this assumption because there are other mechanisms that impact the movement of plutonium other that absorption. As an example, plutonium movement has been demonstrated at the low level waste burial facility in Maxey Flats, Kentucky due to water transport through faults, cracks, and fissures in the geological formations.

Most of the plutonium is in insoluble form. Investigations would have to assess the controls on plutonium migration before storage of radioactive waste in bedrock caverns was implemented. However, no R&D for geologic disposal is being proposed.

P-29 20. On page VI-3 the authors give criteria and assumptions which they use in calculating dose rates for transportation of canned waste. They do not cite any references, experience, or any other basis for the assumptions. Since they are inconsistent with those recently used by Sandia Laboratories in the preparation of NUREG-0170 for the U.S. Nuclear Regulatory Commission, one can only assume that the authors just created them on their own.

Details of assumptions and sources of data are given throughout Section VI, and references for Section VI are given on page R-4 of ERDA 77-42. The assumptions used are intended to be generic and bounding and are generally more pessimistic than those covered in NUREG-0170. See Response P-16, above, also.

P-30 21. On page VI-15, the conclusion is reached that the risks due to transportation accidents are so small that the contribution is negligible to the overall risks. The authors have failed to properly consider that there is no management system currently being used either by U.S. DOT or by U.S. NRC to keep track of the transportation of nuclear materials. This in itself increases the potential consequences should an accident occur. The authors also did not properly assess the possibility of contamination of surface water supplies during the course of transportation accidents. Other factors such as the use of a population density of 250 people per square mile and the use of an undefined type of a shipping cask also render their conclusions inappropriate.

The portion of the comment regarding potential surface water contamination is incorrect - the subject is covered on page VI-12 of ERDA 77-42. See also Response P-16, above.

P-31 22. On page IX-8, it is stated that the storage of SRP wastes in the bedrock under the SRP site has been studied for over 20 years. There is no mention of the opposition by U.S. EPA, the State of Georgia and the National Academy of Sciences recommendation against bedrock storage, or the fact that futher work of this concept was ordered stopped in the early 1970's. Again, it is also interesting to note that even though twenty years of experience had been accumulated at SRP with bedrock storage investigations, it was excluded from the Environmental Statement on Waste Management Operations at SRP (ERDA-1537) published in 1976.

Opposition to bedrock disposal by the State of Georgia and the U.S. EPA has been noted in the Summary. A discussion of bedrock disposal was not given in ERDA-1537 because that EIS dealt only with current waste management operations.

P-32 23. On page X-33, in the Sensitivity Analysis Section, the authors admit that the contamination of the Tuscaloosa aquifer has the largest risk but they try to soften the statement and lead the reader to a directionalized conclusion by indicating that there are promising possibilities for corrective action. They carefully point out that this alternative is "by far the least expensive".

DOE believes the facts presented regarding the risks of bedrock disposal and the possibility of corrective action are true and present upper bounds useful for programmatic decision-making.

P-33 24. On page X-35, the statement is made: "___ corrective action could be taken if some responsible, organized society exists in the future".

It should be pointed out that corrective actions could have been taken during the last twenty years to have a sound national nuclear waste management program for defense wastes but they weren't taken. The assumption made by the authors is greatly over simplified because the issues and technology application are considerably more complex than the statement would lead one to believe.

The quoted statement refers to mitigating measures which may reduce the actual environmental insult from that conservatively estimated in the document. Corrective actions such as these have been taken in the past in response to radioactive releases in the waste tank farm to mitigate the consequences of that leak. The Interagency Review Group on Nuclear Waste Management (IRG) has attempted to formulate a sound national nuclear waste management program for defense wastes. DOE intends to adopt the following IRG recommendation pending appropriate environmental review:

"The IRG recommends the DOE accelerate its R&D activities oriented toward improving immobilization and waste forms and review its current immobilization programs in the lights of the latest views of the scientific and technical community. Since final processing of defense waste has been deferred for three decades the IRG also recommends that remedial action, including immobilization of the waste, should begin as soon as practicable."

P-34 25. On page X-36, the authors suggest that atmospheric exposure could be reduced by the installation of a rapid warning system that would be activated in the event of a release of radioactivity. The statement is made:

"The warning network might be any combination of in-place sirens, roving automobiles with loud speakers, commercial radio and television announcements, C.B. radio, operators ringing telephones, and the civil defense warning system".

It is interesting to speculate that if all these were employed, there would be a need to calculate a "panic" risk factor and thus come up with a dollar value for the human lives lost in the process. It is irresponsible to consider this type of communication as a back up for reduction of atmospheric exposure. The back up has to be in place well ahead of this type of process.

Any rapid warning system deployed in the future would probably be accompanied by an education process to minimize panic if the system were actually ever used. DOE is not aware of any methodology for calculating a panic risk factor or an estimate of any lives that might be lost due to panic. However, recent experience at the Three Mile Island nuclear reactor would indicate that no public casualties would be incurred from panic.

STATE OF GEORGIA COMMENTS
REGARDING:
Draft Environmental Statement - "Waste Management Operations - Savannah River Plant; Aiken, South Carolina", ERDA - 1537 (October, 1976)
December 15, 1976

A review of the Draft Environmental Statement for the Savannah River Plant Waste Management Operations has been completed. The following comments are in order:

A. Non-radioactive Wastewater Discharges

1. The E.I.S. indicates (II-46) that spent drum cleaning solution is discharged without treatment in 16,000 gal. batches "after analyses to confirm acceptability of the release." The "analysis" to determine "acceptability" clearly applies only to radioactive contamination. Discharge contains 10,000 lb/yr of trisodium phosphate and 9,000 lb/yr of phosphoric acid. Raw discharge of this wastewater does not reflect good waste treatment practice and would not comply with minimum treatment requirements in Georgia.

2. According to the E.I.S. (II-53), various unspecified wastewater sources contribute to the trade waste system which is "designed to handle ordinary waste chemicals that are not contaminated beyond trace levels." Although "trace levels" clearly refers to radioactive contamination only, this wastewater is discharged untreated. Throughout this E.I.S., the assumption seems to be that any processing waste not contaminated with radioactive material requires no treatment. Non-federal public and private facilities are not generally allowed the luxury of discharging all process wastewater untreated after merely confirming that it is not radioactive.

3. Analytical laboratory wastewater is discharged without treatment (II-46). No chemical or biological characterization of this wastewater is given.

4. The E.I.S. states (II-55, 56) that sulfuric acid and sodium hydroxide used as regenerants in the deionized water systems in the Reactor and Separations areas are discharged after "moderate neutralization." Water regenerants in the Heavy Water area don't even receive "moderate" neutralization. Moderate neutralization or non-neutralization does not appear to constitute good wastewater treatment practice as would be required by various State and Federal regulations for non-Federal facilities.

5. Coagulant chemicals and suspended solids removed in water treatment facilities are discharged back to the Savannah River (II-55,56). The draft E.I.S. indicates (V-15) that alternative procedures were studied but rejected as uneconomical. Discharge of solids removed in water treatment plants back to surface waters by non-Federal facilities

Responses are given on pages K-17 through K-25 of ERDA-1537.

has not been allowed in various permits issued by EPA. These non-Federal facilities are not generally allowed the alternative of ignoring such requirements because they are considered uneconomical.

6. The E.I.S. indicated (V-15) that conversion from chromate-containing to organic corrosion inhibitors is being studied. The Georgia Environmental Protection Division is presently requiring other dischargers in the same area to either discontinue use of metallic inhibitors or provide treatment to remove the metals from the wastewater. The Division sees no good reason why a more lenient standard should be applied to this Federal facility.

7. The report states that the use and disposal of polychlorinated biphenyls (PCB's) at SRP has been specifically controlled since 1972. How were they previously handled before 1972 when they weren't controlled? Since PCB has been detected in sediments from Four Mile Creek and Pen Branch it would be reasonable to expect that this residual concentration is a result of operations prior to 1972. The conclusion presented that off plant sources may be the primary contributors of PCB may not be correct. A detailed discussion of this issue is necessary and in particular its probable relationship to any possible future actions that might be needed to remove previously deposited PCB.

8. In Section III-73 of the report, the concentration of several parameters in Ash Basin effluent water is compared with Drinking Water Standards. This presentation shows the concentration of selenium to be at 0.02 parts per million in the effluent vs 0.01 parts per million for the drinking water standard. This is double the standard yet there is no discussion of the significance or impact presented in the report.

9. In Section V-15 of the report under "Alternatives Studies but not Adopted", it is indicated that alternative methods for water treatment associated with chemical discharges to seepage basins are not economically feasible. There is no discussion of what methods were studied nor is there any indication of the basis for reaching the conclusion that was reached. This could be a very important issue as it relates to the equilibrium adsorption of radionuclides in the soils beneath the basins. (This is discussed further in additional comments for radiological discharges).

B. Non-radiological Atmospheric Discharges

1. The report indicated (III-59) that the calculated contributions to the annual average $SO_2$ ambient concentration at the SRP boundary is less than 33 micrograms per cubic meter. This compares to the Georgia standard of 43 micrograms per cubic meter. This is 76 percent of Georgia's standard and essentially means that any industrial development on the Georgia side of the Savannah River near SRP must

be limited. Fuel burning equipment of the capacity being used should reasonably not be allowed to make such a reported impact. In effect, it is endangering the economic development of Georgia.

2. The report gives conflicting efficiencies of the electrostatic precipitators that were installed in November, 1975. On page II-60 a value of greater than 99% is reported while on page III-61 they report a value of 95%. Also, no increment of particulate contribution to the ambient air by SRP is reported in the EIS.

3. Under normal conditions there should be no significance from other non-radioactive air emissions, however, there is a possibility that hydrogen sulfide odor could be detected during adverse meterological conditions.

C. Radiological Issue Comments

1. About 80-130 million gallons of water containing various radionuclides are discharged to several different seepage basins at SRP. In addition to the radionuclides other chemicals are also discharged to these sam basins (600,000 lbs of $HNO_3$, 200,000 lbs of NaOH, 12,000 lbs of $H_3PO_4$, 1200 lbs $Na_2$-$Cr_2O_7$, and 50 lbs of $H_g$.) The report makes a strong case for the ion exchange capability of the soil in the retention of the radionuclides, however, there is nc evidence presented to show any recognition of the effect of the chemicals on the adsorption capability of the soils. If transport models are being used to predict the distribution and concentration of radionuclides in the groundwater contacting the soils, how have the shifts in equilibrium adsorption due to the chemicals been factored into the models?

2. The EIS (III-78) considers the additive impact of other non-SRP facilities. One such facility is the proposed Barnwell reprocessing facility and the report indicates that 16,000,000 curies of Kr-85 will be discharged via atmospheric releases from Barnwell. SRP discharges 520,000 curies of Kr-85 per year itself. These numbers compare to the SRP guide release number at 950,000 curies. Very little attempt is made in the report to discuss the additive impact of both facilities in relationship to SRP's waste management program. This is an important issue and it should be discussed thoroughly in both Chapters II, III, and IV of the report.

3. In section V-6 of the report, alternatives associated with Kr-85 atmospheric discharges are discussed. It is stated that there are no plans for an active research program aimed at Kr-85 removal from effluent gases during fuel reprocessing and that pertinent R/D at other sites will be followed for possible application. This is improper consideration of the whole issue. We agree that research is not necessary at SRP and it is not necessary elsewhere either because it has already been completed and commercial

equipment for Kr-85 removal is available now. This is supported by ERDA's own contractor, Battelle, in its preparation of ERDA-76-43 report entitled "Alternatives For Managing Wastes From Reactors and Post-Fission Operations in the LWR Fuel Cycle". Georgia expects ERDA to exercise its responsible role in the establishment of an abatement plan and timetable for the control of Kr-85 releases to the atmosphere. This should be treated properly in the EIS before it is released in final form. Georgia's position has already been expressed on this issue regarding the proposed Barnwell facility (see Governor Carter's letter attached).

D. Bedrock Storage Issue

The EIS for the SRP does not cover the use of the SRP site for permanent storage, particularly bedrock storage. ERDA has indicated that it is beyond the scope of this report because a separate EIS on long range waste management plans is currently in preparation. Georgia objects strongly to this piecemeal consideration of waste management plans because current operations and future plans must be tried together because of the long half-life of many of the isotopes in question.

The concept of using SRP for bedrock storage has already been postulated by ERDA and work has occurred on site. This is discussed in WASH-1202 (1972, 1973). In addition report, SRO-TWM-76-1, states that bedrock storage is the "principle" candidate for long term storage. Since bedrock storage has already been advocated and original projections of FY-81 were indicated for beginning of actual storage, this is an issue that is not long range. The present draft EIS must consider this issue and Georgia must insist that the EIS not be issued in final form until it is considered.

Since the fresh water aquifer which serves all of South Georgia lies underneath this geographical area Georgia is very concerned about any attempt to establish a bedrock storage site in the vicinity of SRP. In 1972, Governor Carter established Georgia's position of opposition to bedrock storage at SRP and that position still remains unchanged. (See attached letter).

The question of seismic activity in a geographical sphere of influence which could incorporate SRP has been treated very poorly in the current draft EIS, on page II-160 the report indicates that on the basis of three centuries of recorded history of earthquakes, an earthquake above an intensity of VII on the modified Mercalli scale would not be expected at SRP. Yet a few sentences later the report states that during the past 100 years, the area within a 100 mile radius of the SRP has experienced one shock of intensity X, one shock of intensity VIII, two shocks of intensity VII, and twelve shocks of intensity V. At first reading these two statements appear to be in conflict with each other and more explanation is necessary. Also, the

Richter scale is usually used to report earthquake activity to the general public so if the modified Mercalli scale is going to be used in the EIS, the intensity levels should be identified as in the following examples:

| Modified Mercalli Intensity Scale | |
|---|---|
| XII | Damage nearly total; Large rock masses displaced. |
| XI | Rails bent; Underground pipeline out of service;-------- |
| X | Most masonry and frame structures destroyed with their foundations; Serious damage to dams; Large landslides-------- |
| IX | General Panic; Masonry destroyed-------- |
| VIII | Twisting, fall of chimneys, Factory stacks, Monuments, towers, and elevated tanks-------- |
| VII | Damage to masonry; Small slides; Concrete irrigation ditches damaged-------- |



The report mentions the Bel Air Fault northwest of Augusta, Georgia and admits that the rate and character of its movement has not yet been resolved, nor has its significance to the techtonic framework of the eastern U.S. been determined. The many other faults in this area of Georgia are not even mentioned in the report. The poor treatment of the seismic activity in the EIS helps to reaffirm Georgia's position on bedrock storage.

Office of NEPA Affairs
U. S. Department of Energy
Washington, D. C. 20545

June 3, 1979

Dear Sir:

Q-1 This is in reference to your draft environmental impact statement entitled "Long-Term Management of Defense High-Level Radioactive Wastes" for the Savannah River Plant in Aiken, South Carolina. I have reviewed this statement and have the following comments to make:

1. It would be helpful if you would state what the level of background radiation is at SRP and the surrounding area. This should be given in rems per year and rems per calendar quarter.

The calculated annual background radiation level in the vicinity of SRP is 120 mrems and is given in Section III.B (page III-12) of this EIS.

Q-2 2. It is not clear if there was a review of current studies that suggest that exposure to low levels of radiation could be harmful to humans.

The potential effects of exposure to low-level radiation has been considered in developing the health effects estimates given in Tables XI-5 through XI-9. Additional discussion is given in response to Comment M-3.

Q-3 3. In reference to the probability of sabotage; a sabotage attempt on SRP need only be effective in disrupting normal operations and bringing media attention for the attempt to be successful. An attack on SRP would accomplish both of these, which are the primary goals of terrorism. Also, with the current backlash against nuclear power, the probability of a sabotage attempt is greater.

The SRP has a continuously evolving safeguards program to guard against sabotage. However, sabotage has been analyzed in the technical reference document for the EIS (ERDA 77-42) and potential environmental impacts summarized for inclusion in the EIS (Tables V-12 through V-16).

Q-4 4. Why are there no restrictions on farming land that could become contaminated by P238,239 in the event of a leak? It should be remembered that farming operations cause large amounts of particulates to be released into the air. If a field is contaminated by P238,239 and farming operations are allowed to be conducted on it, there is a chance that workers may inhale these materials.

In the unlikely event of a leak, the contaminated area will be restricted to the SRP site and corrective actions will be taken. Examples of land contamination and corrective actions are given in Section XI of this EIS.

Q-5 5. Costs and cost differences should not be important considerations in choosing an alternative. The safest form of management should be chosen regardless of costs.

Cost is only one of the many factors important in the selection of a proper waste management program. In making its final decision, DOE will consider environmental, technical, and social factors as well as cost.

Thank you for providing the opportunity to comment on this statement, which hopefully will be of assistance to you. I would appreciate receiving three (3) copies of the final statement.

Sincerely,

Bennie Ricardo Brown, III
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